Cours de Botanique

professé à la Faculté des Sciences de Lyon

PAR

J. BEAUVERIE

Professeur à la Faculté des Sciences de l'Université de Lyon

LES GYMNOSPERMES

vivantes et fossiles

ATLAS DES PLANCHES

LYON

BOSC Frères, M. et L. RIOU

IMPRIMEURS-ÉDITEURS

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1933

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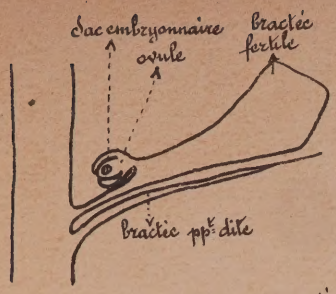
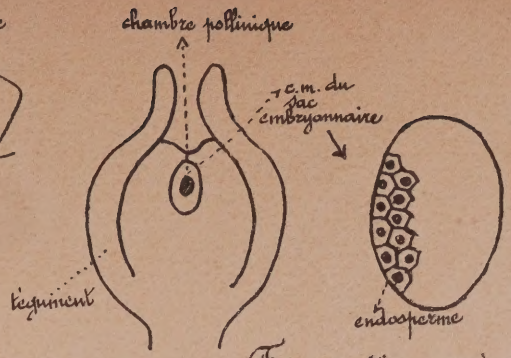
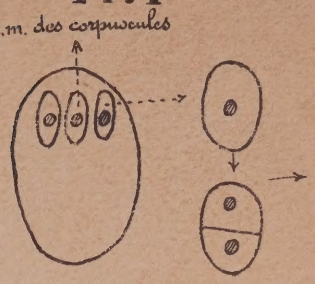
1933

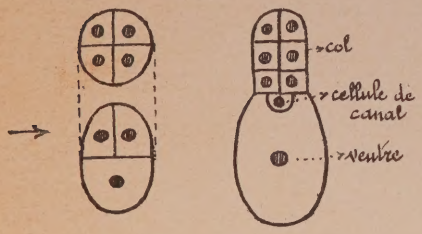


Écaille femelle de Gymnosperme

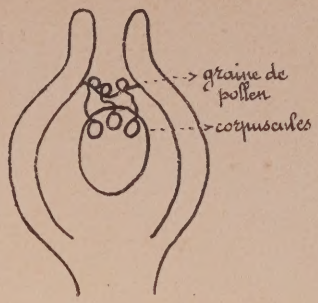




Formation des corpuscules



(suite) Corpuscule



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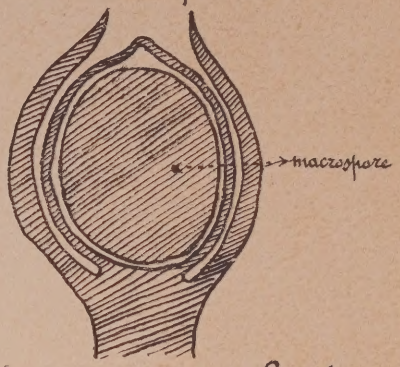
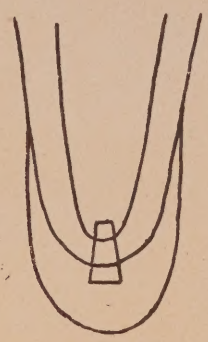
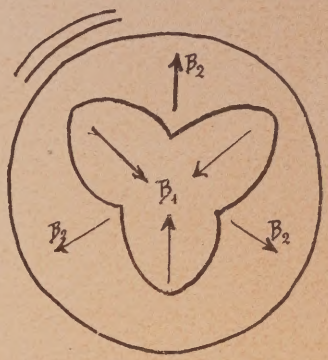


Macrosporange de Lepidocarpon

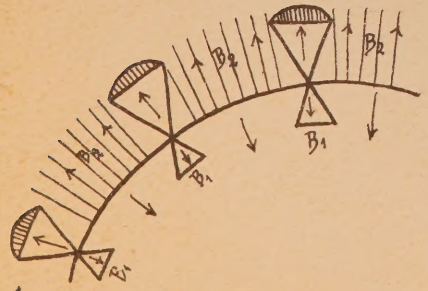
Ovule de Gnétacée



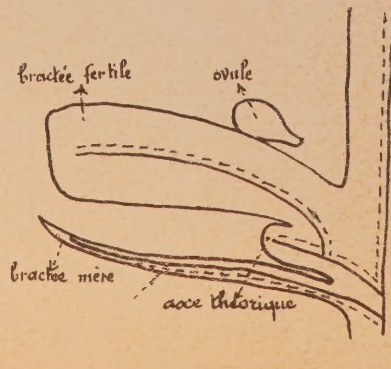
Racine triacrorhize de Gymnosperme



Coupe d'une tige de Sphenophyllum

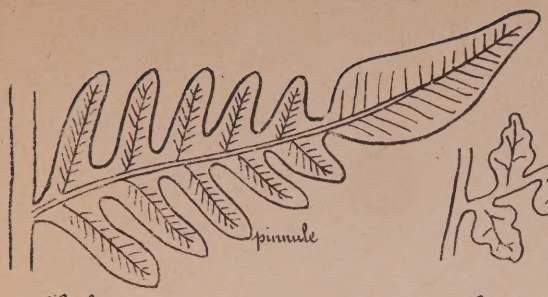


Tige d'Heterangium

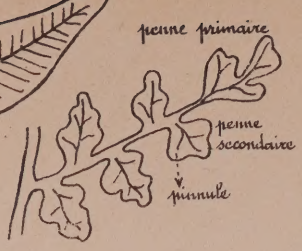


Explication de Van Tieghem

Fleur du Pin



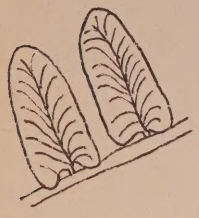
Alethopteris



Sphenopteris

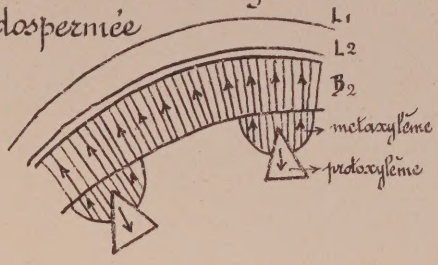
Pecopteris

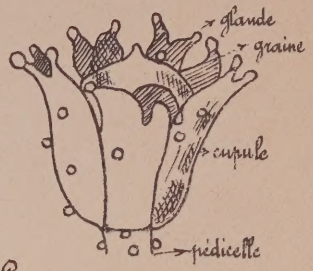
Odontopteris



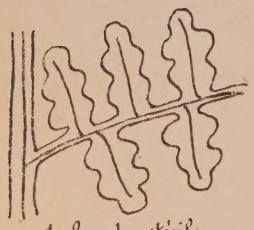
Nevropteris

Exemple de structure de tige de Ptéridospermée

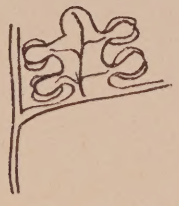




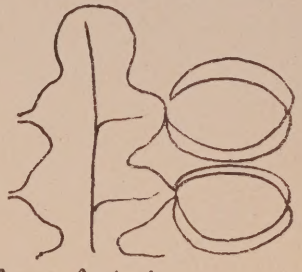
Lagenostoma



1. fronde stérile

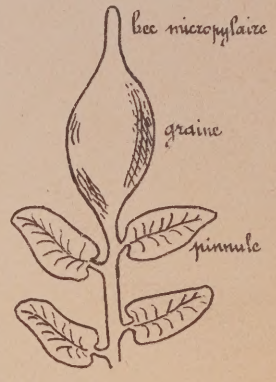


2. fronde fertile

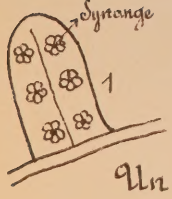


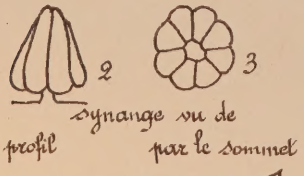
3. pinnule fertile

Pecopteris Pluckeneti (1-3)

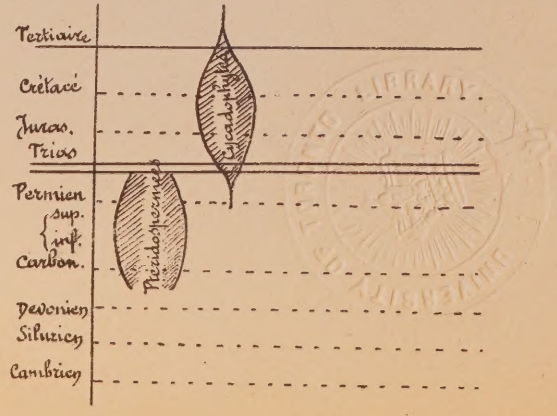


Nevropteris heterophylla





Un Pecopteris du type Fougère Marattiale (1-3)



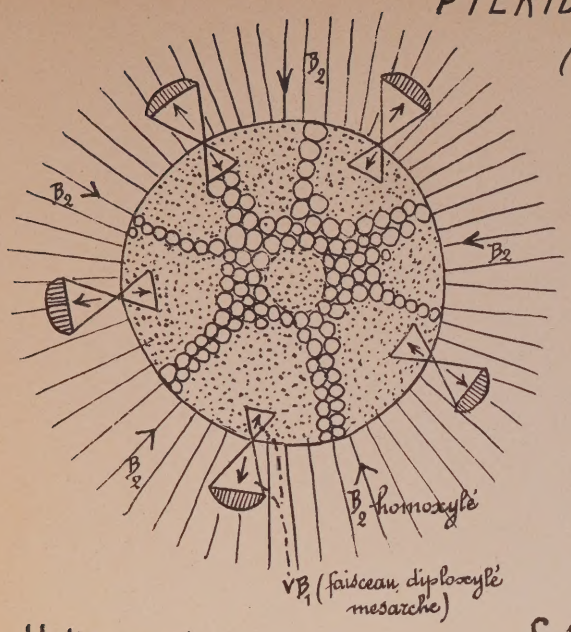
Phylogenie des Ptéridospermées →

PTÉRIDOSPERMÉES

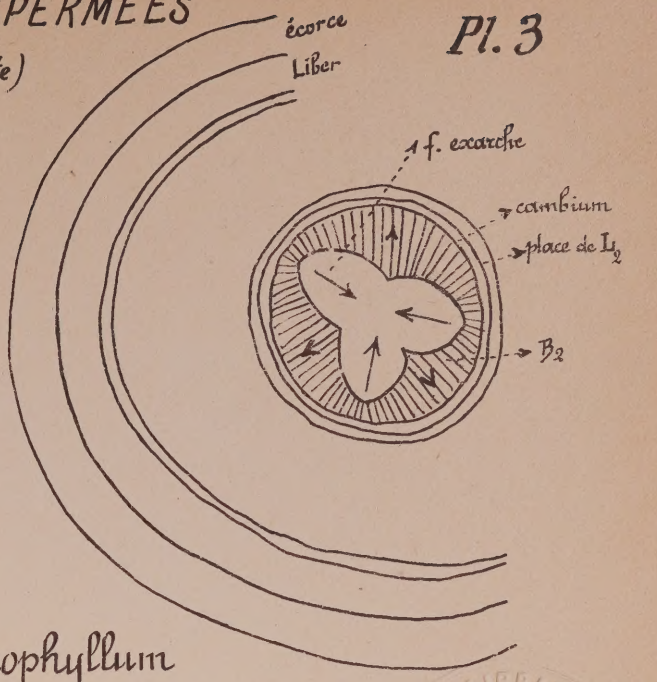
PTÉRIDOSPERMÉES

(Suite)

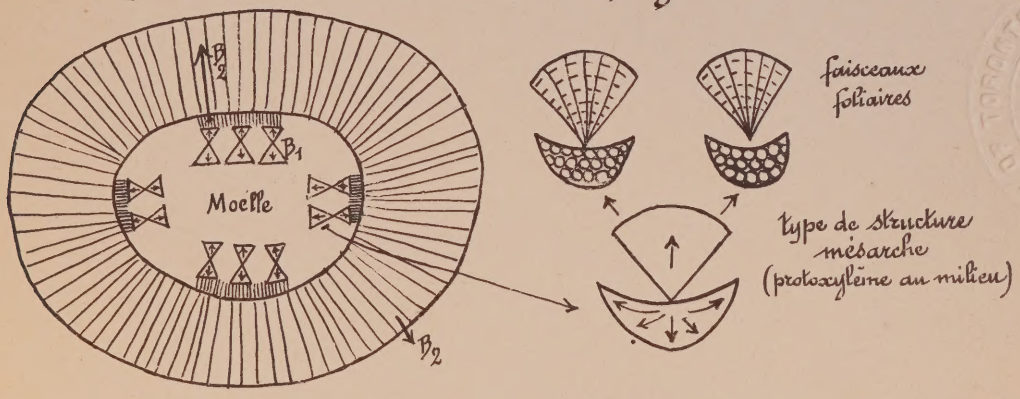
Pl. 3



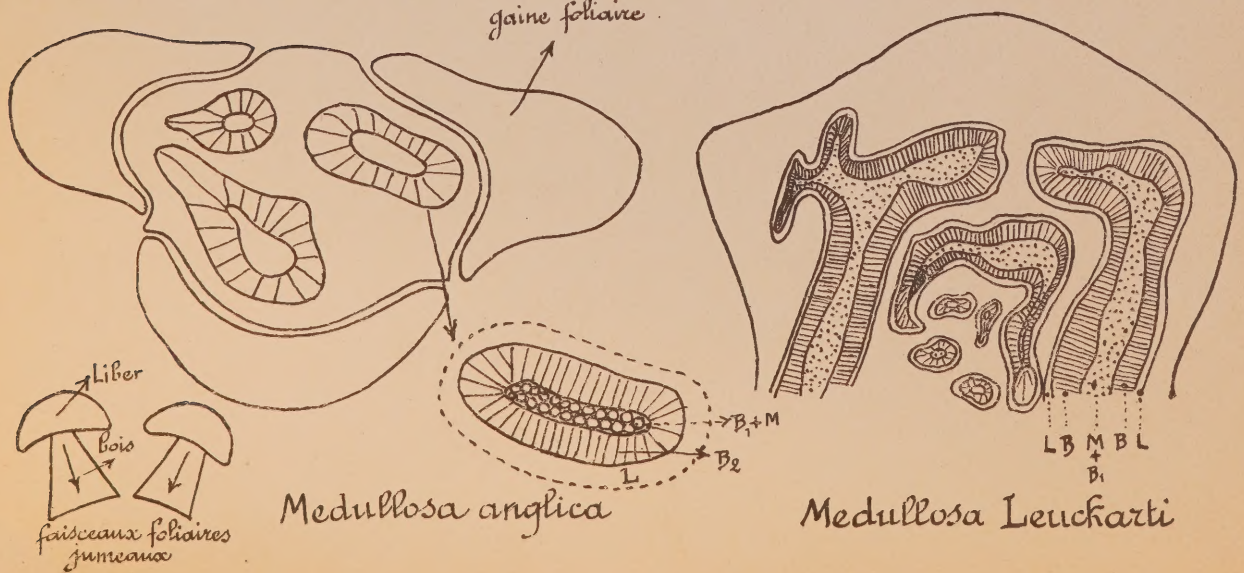
Heterangium



Sphenophyllum

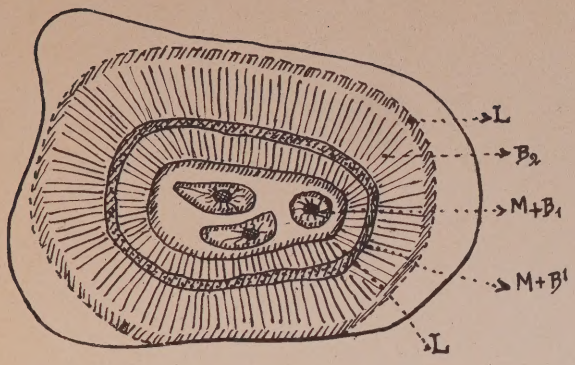


Lyginodendron

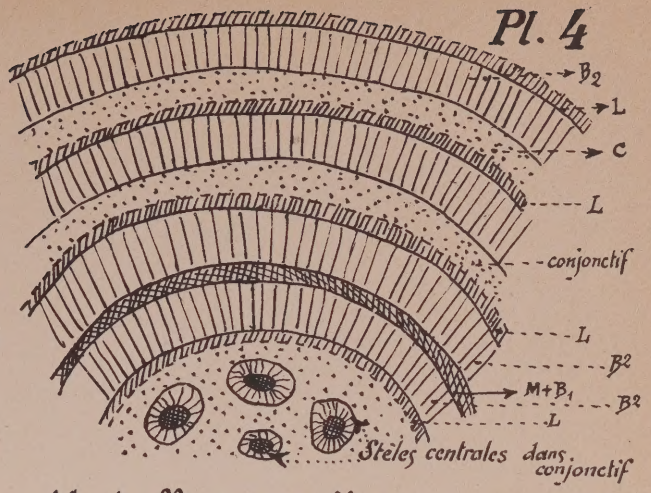


Medullosa anglica

Medullosa Leuckarti



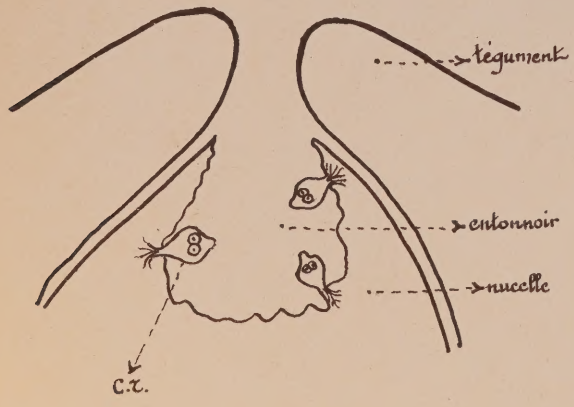
Medullosa stellata

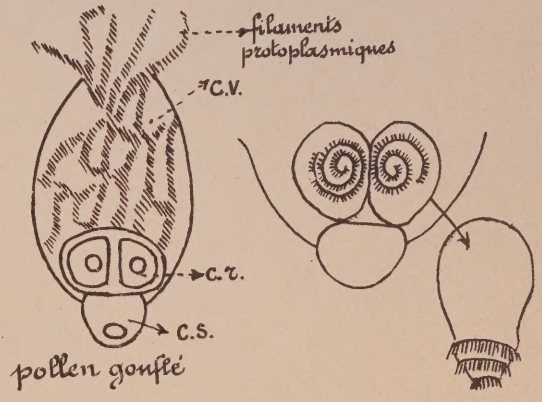


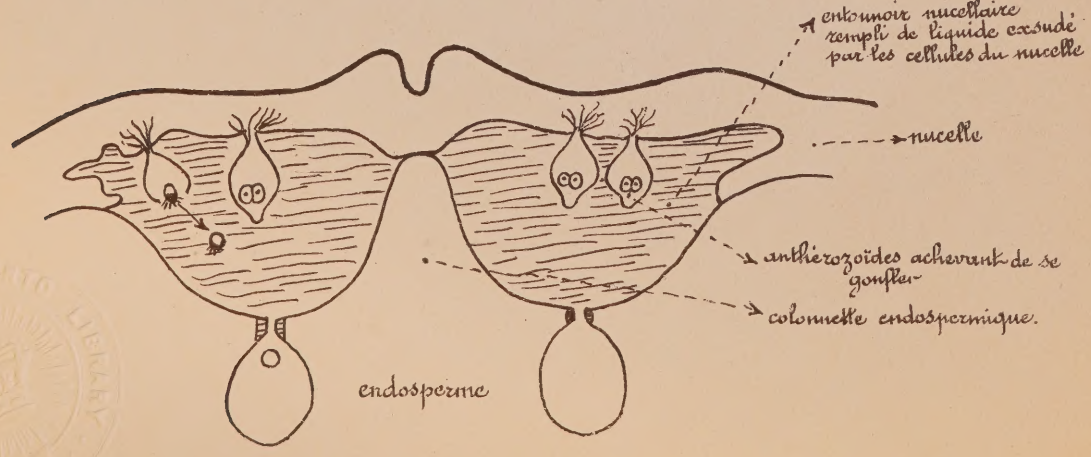
Medullosa stellata var. gigantea

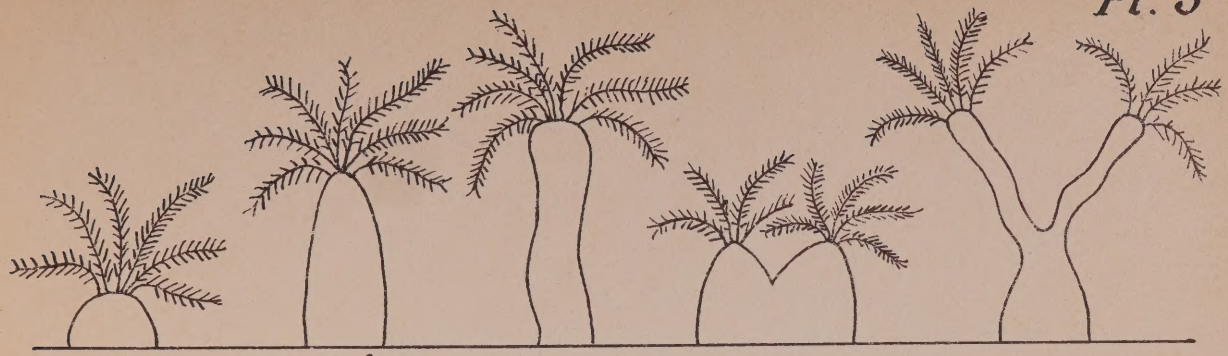
PTÉRIDOSPERMÉES (fin)

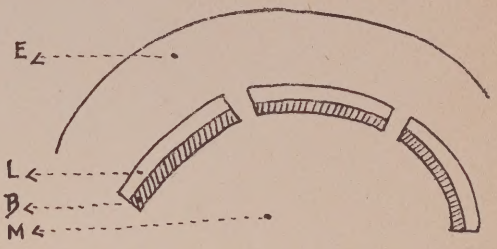
Reproduction du Ginkgo biloba (Natrices)





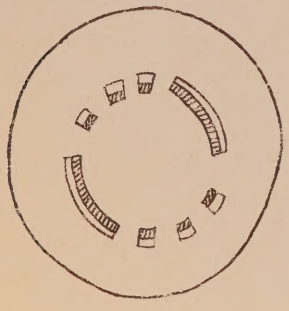




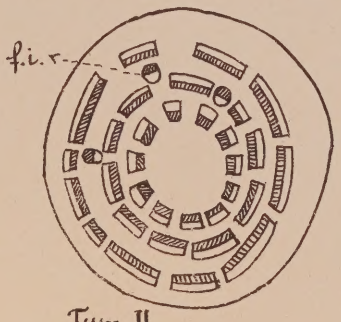


Anatomie des tiges jeunes

Anatomie des tiges âgées



Type I



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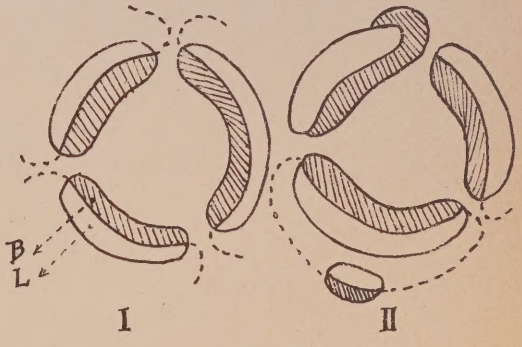
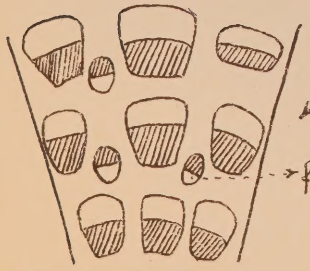
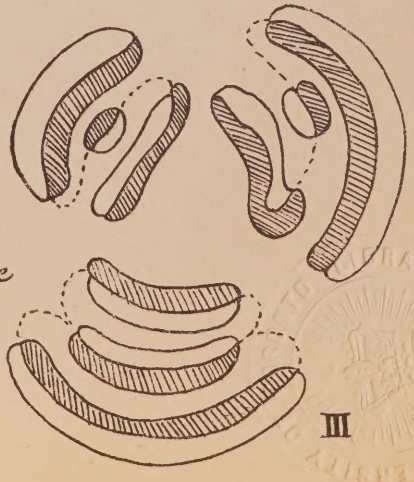




Quelques faisceaux grossis

Rattachement à la structure polystélique des Ptéridospermées type Medullosa



CYCADINÉES

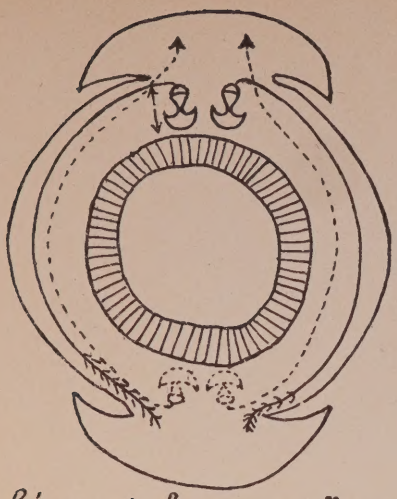
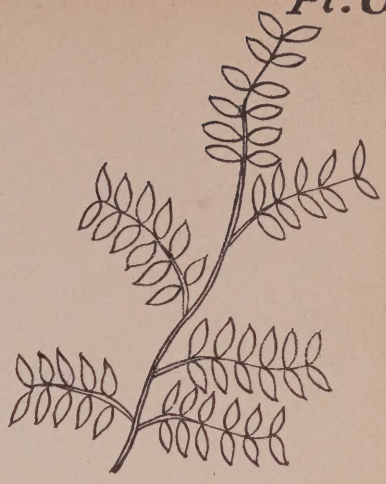


Schéma de la course "en ceinture" des faisceaux foliaires jumellés du Stangeria paradoxa

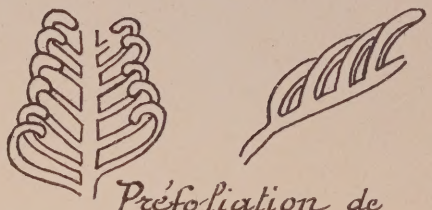
Cycas



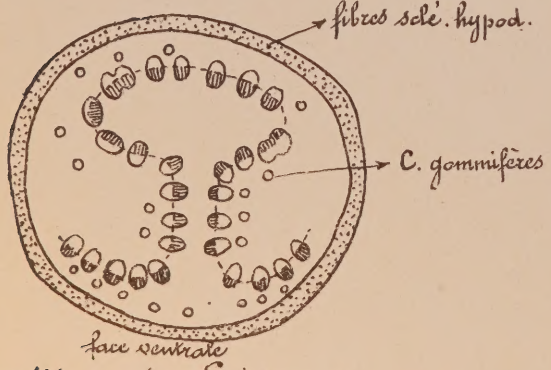
Bowenia

Plan de la feuille des Cycadacées

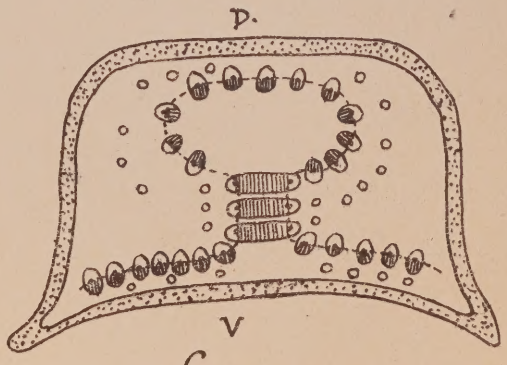
Pinnules de Cycas Stangeria Encephalartos



Préfoliation de Cycas Zamia



Disposition des faisceaux foliaires d' Encephalartos

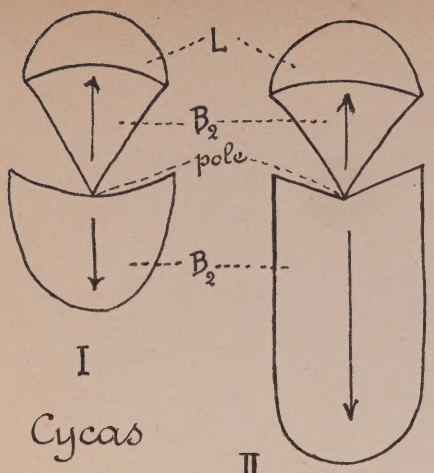


Cycas

Zamia

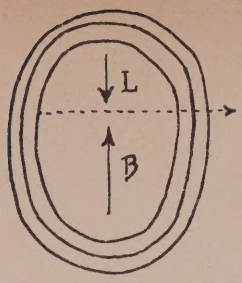
CYCADINEES (Suite)

CYCADINÉES
(Suite)



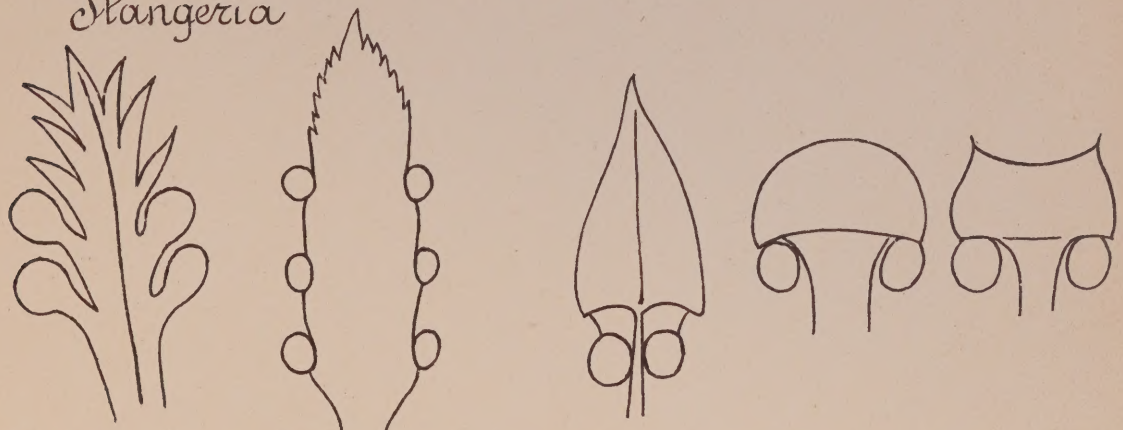
Cycas

Stangeria



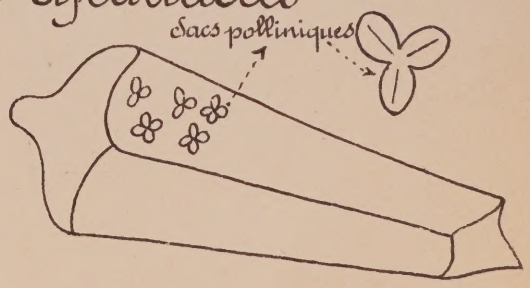
au delà de la base

Faisceaux diploxylés du rachis des Cycadacées

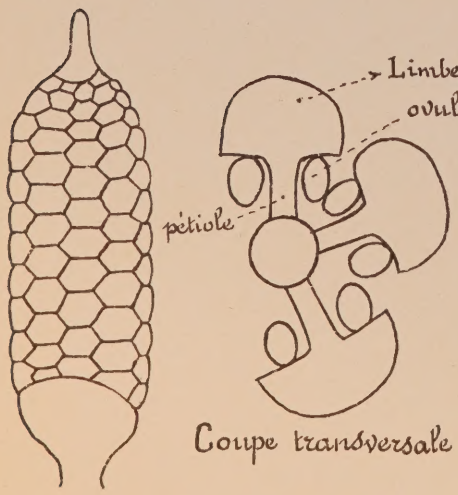


Cycas revoluta — Cycas circinalis — Dioon — Zamia — Ceratozamia

Reproduction chez les Cycadacées

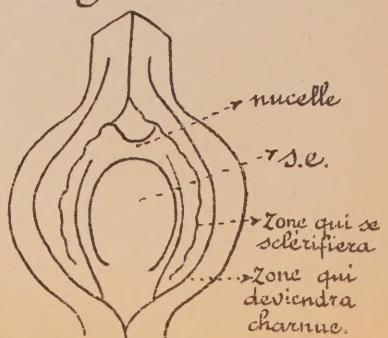


Etamine de Cycas



Cône femelle de Zamia

étamine de Zamia



Ovule de Cycadacées

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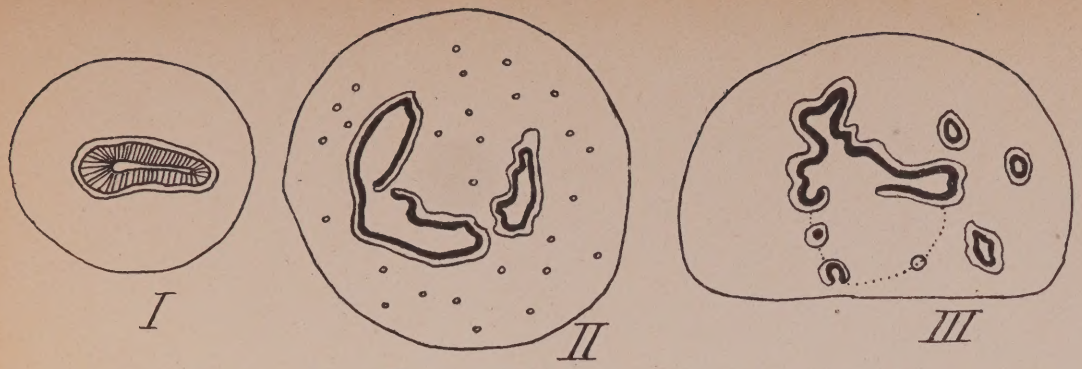
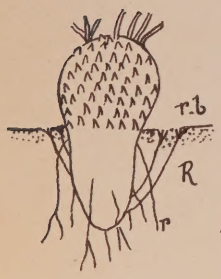


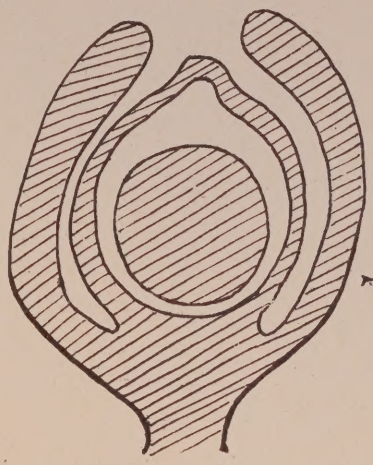
Encephalartos Barteri Coupes transv. de tige très jeune.

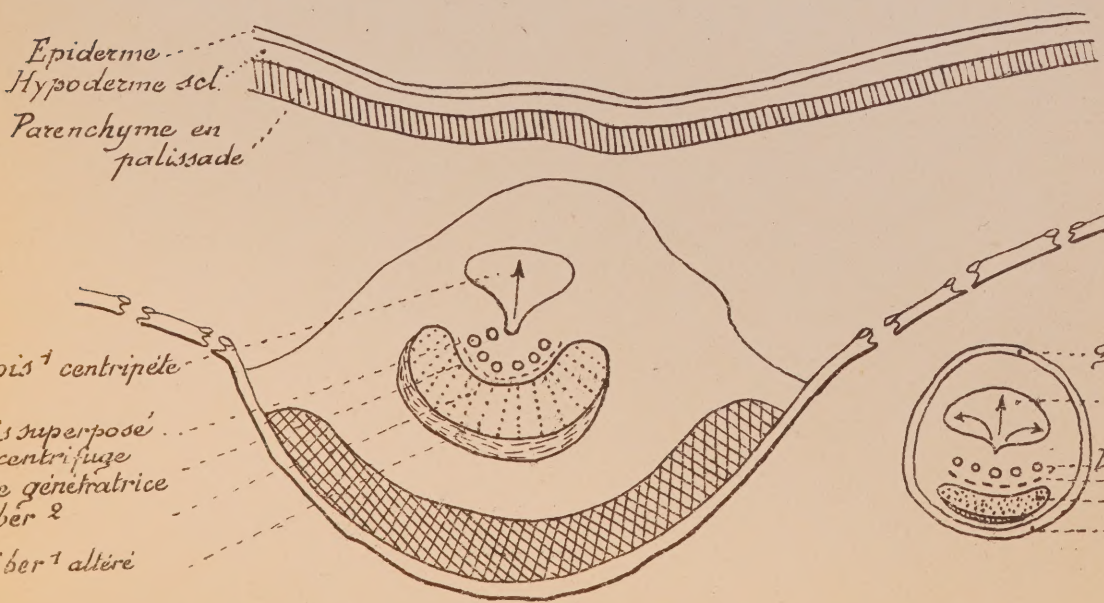
I. Coupe au dessous du raccord de la tige et de la racine
II et III Coupes à des niveaux successifs de l'axe végétatif en allant de la base au sommet.



Racine de Cycas

r Radicelles normales
rb — botryoïdes





FOLIOLE de CYCAS REVOLUTA

UNIVERSITY OF TORONTO LIBRARY

feuille de Ginkgo biloba

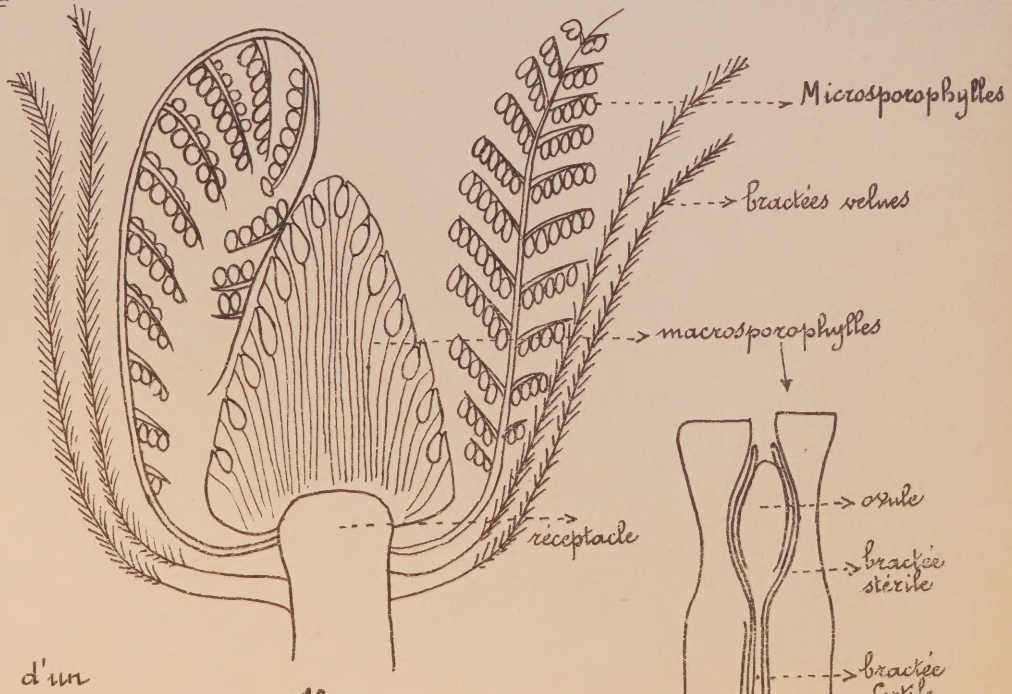
rameau ♀

anomalie

rameau ♂

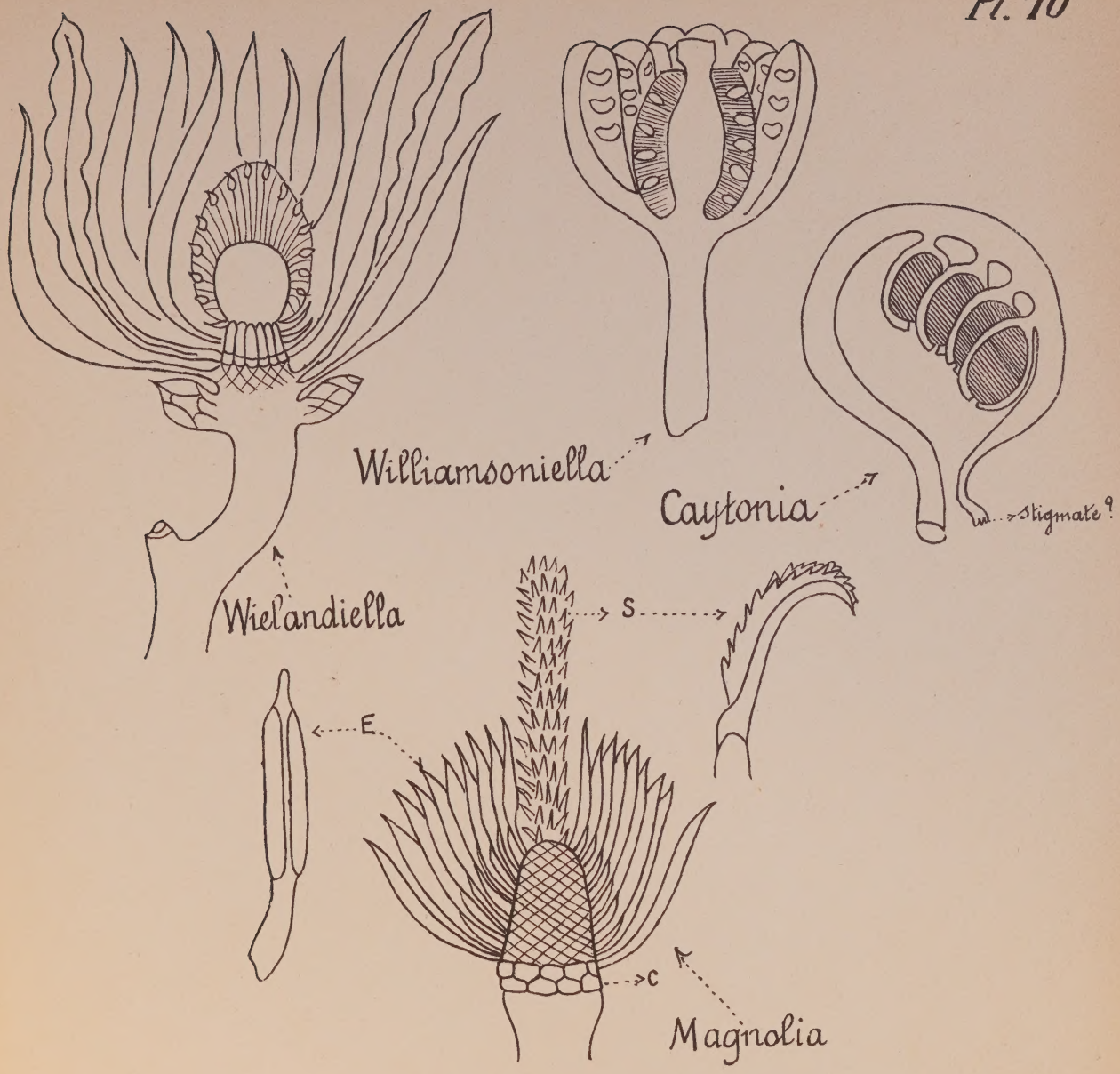
rameau fructifère de
Dicranophyllum gallicum.

Reconstitution d'un
Bennettites

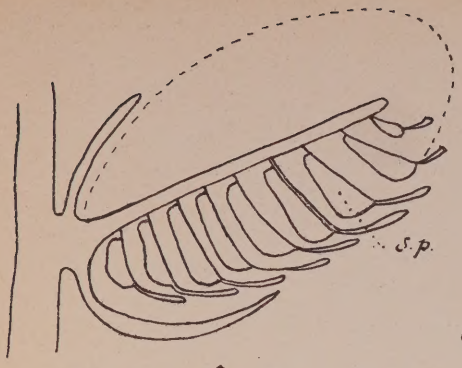


Fleur

GINKGOÏNÉES BENNETTITINÉES

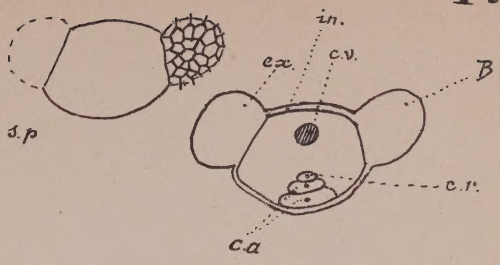


BENNETTITINÉES, etc.

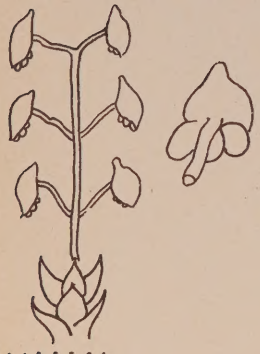


CONE MÂLE de PIN

UNE ÉTAMINE de PIN

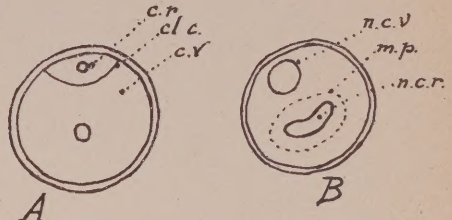


POLLEN de PIN



THUYA

IF



POLLEN

A JUNIPERUS. B ANGIOSPERMES

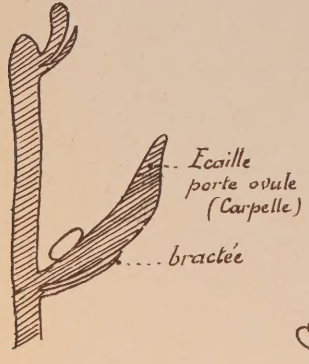
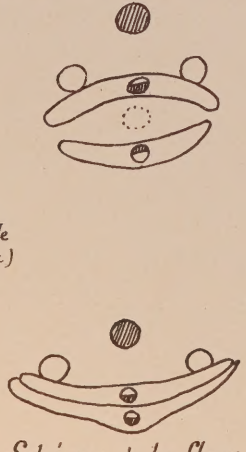


Schéma du Cône femelle de Pin



Schémas de la fleur de Pin

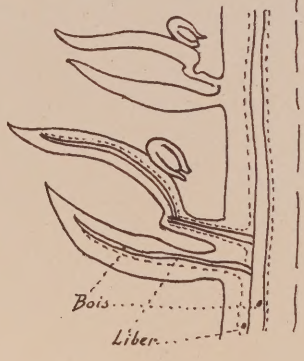
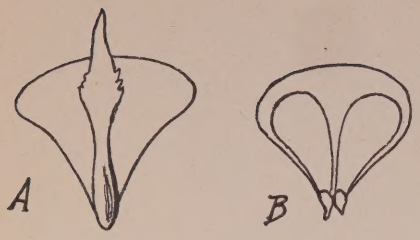


Schéma du Cône ♀ de Pin (Hypothèse de Van Thiegem)

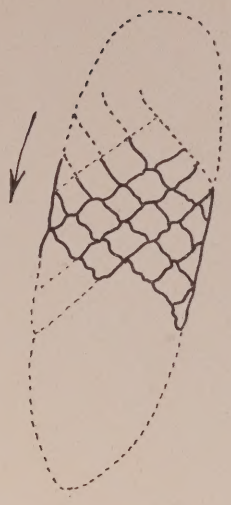
Ovule de Pin

CONIFÉRES

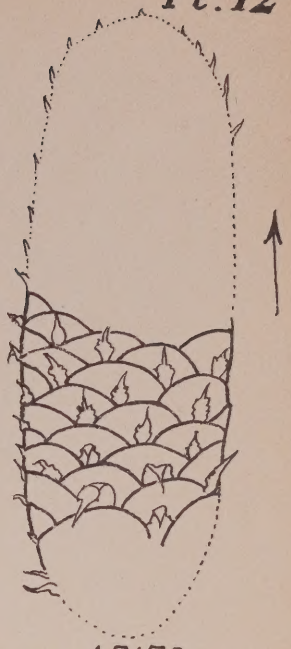


ECAILLE ♀ d' ABIES

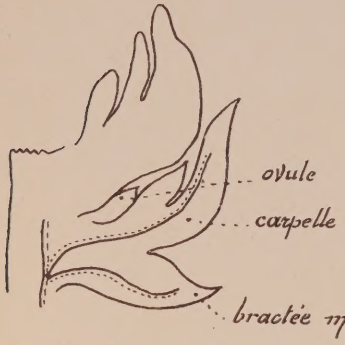
A. Face externe B. Face interne



Cône ♀ EPICEA

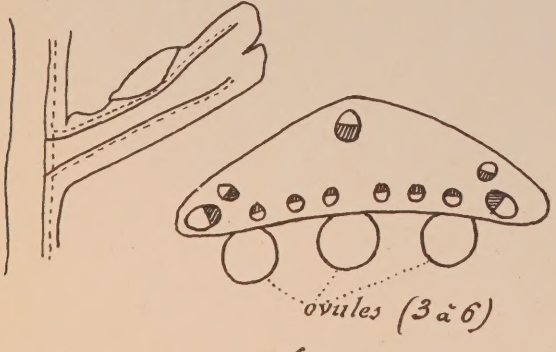


Cône ♀ ABIES



CRYPTOMERIA JAPONICA Taxodiées)

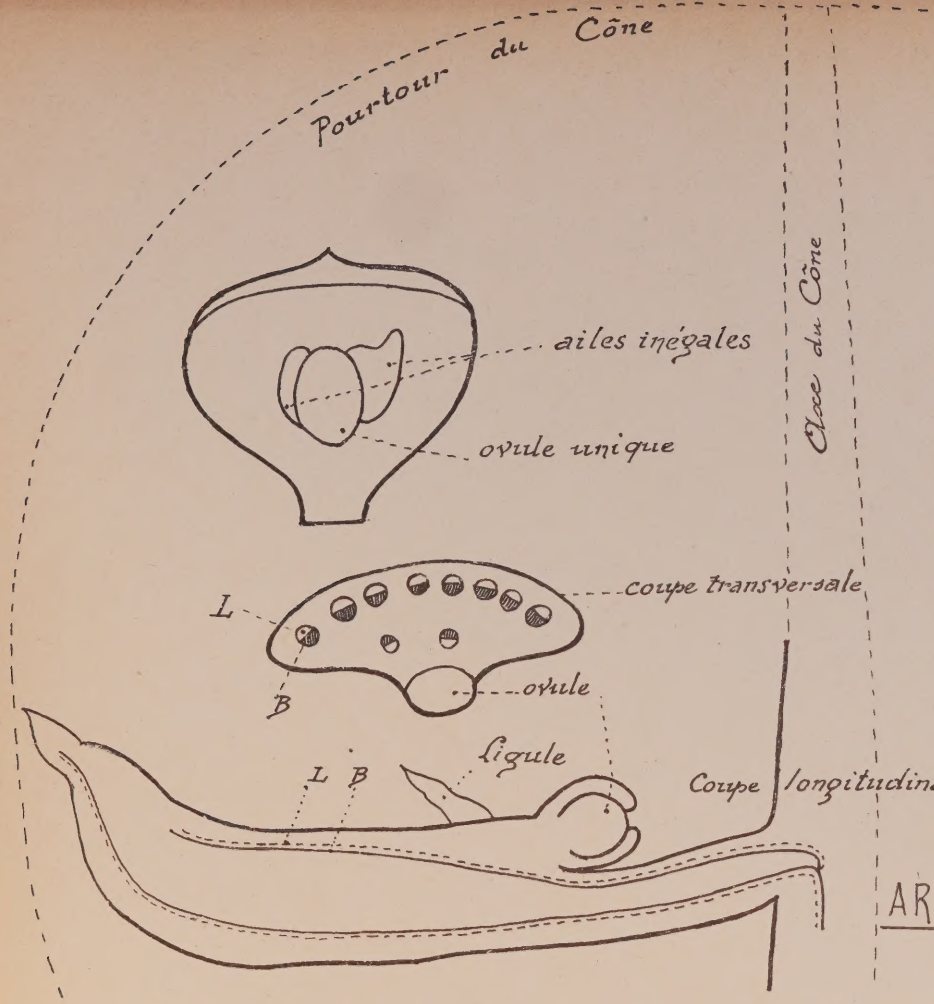
Ecaille adulte du Cryptomeria



SEQUOIA (Taxodiées)

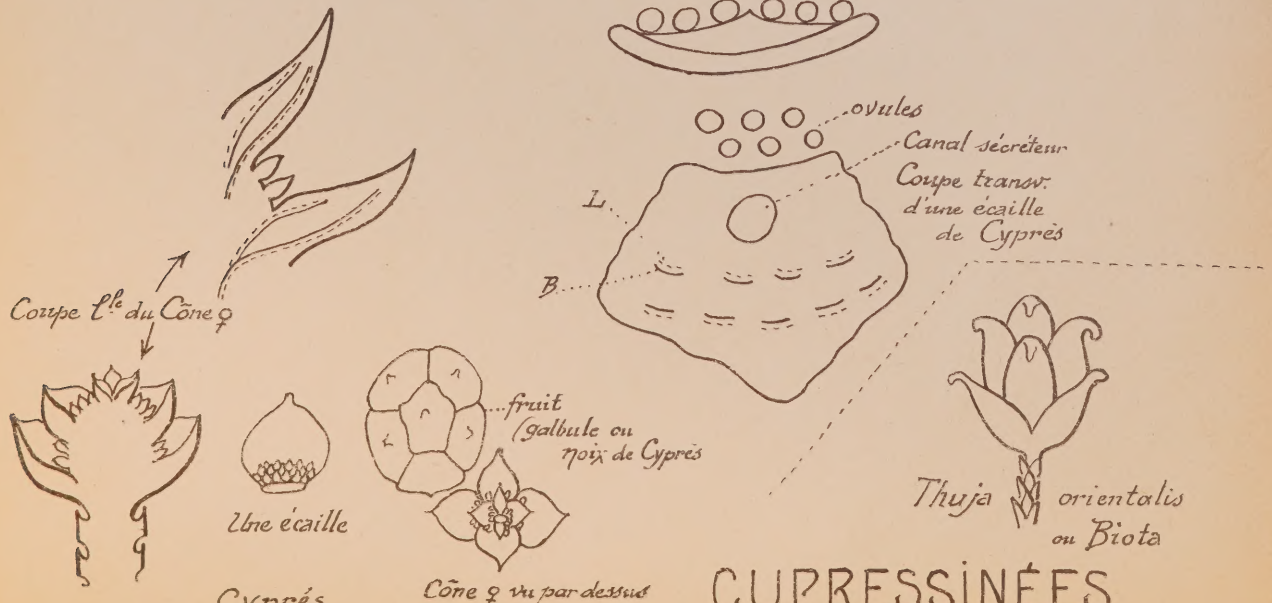
CONIFÈRES

UNIVERSITY OF TORONTO LIBRARY

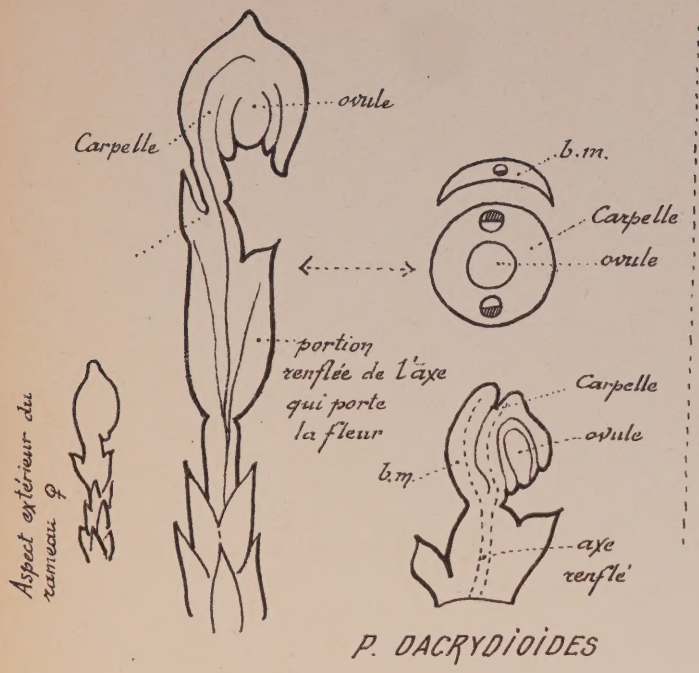


ARAUCARIÉES

Une écaille du Cône d'AGATHIS (DAMMARA) AUSTRALIS

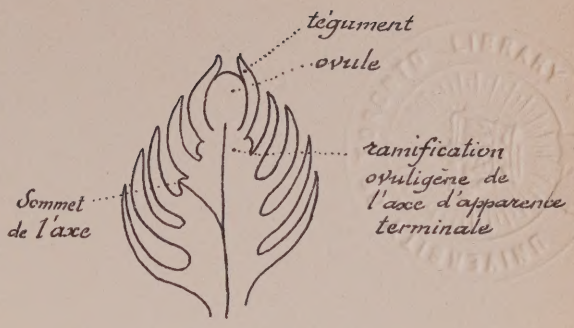


CUPRESSINÉES



P. DACRYDIOIDES

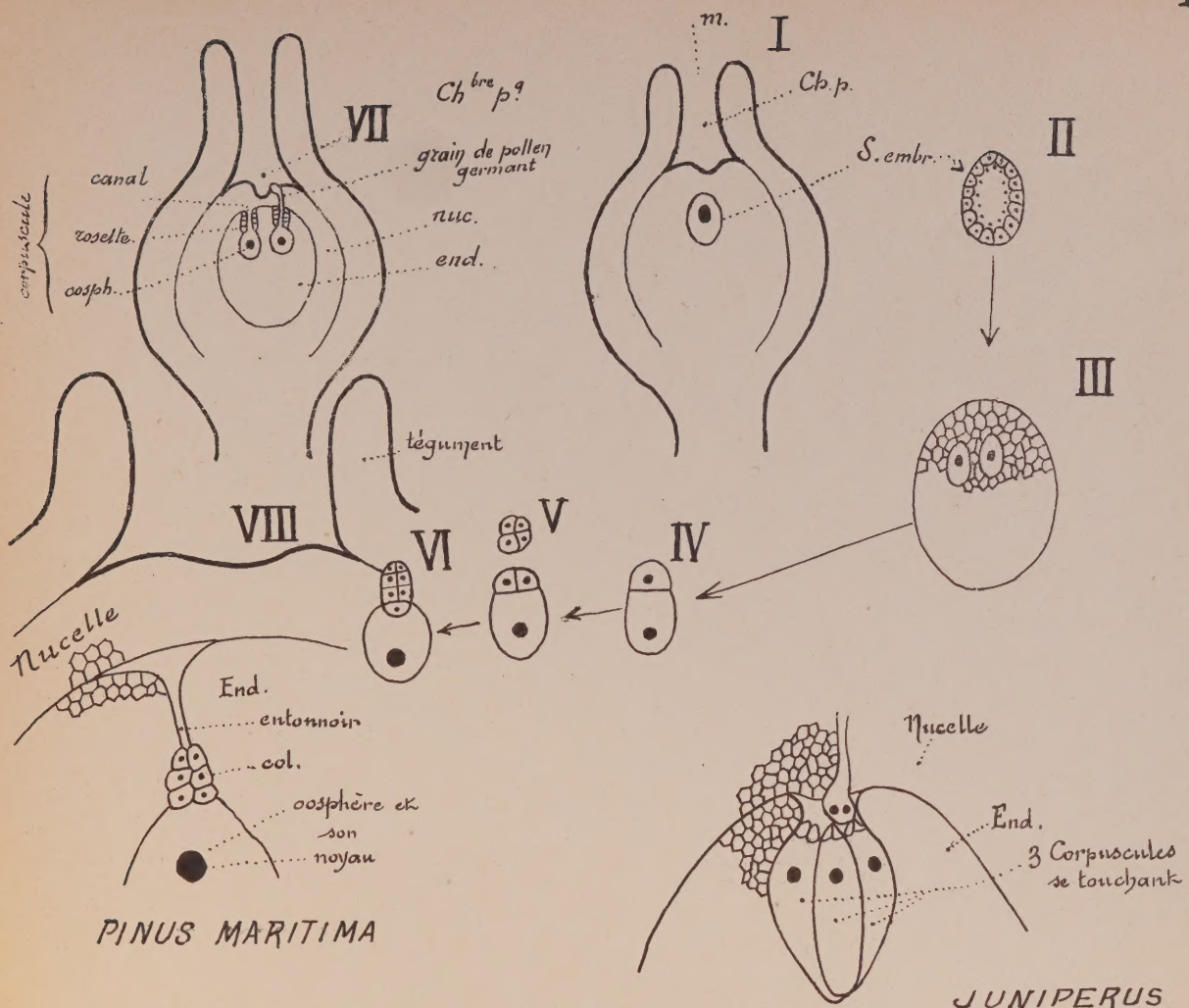
PODOCARPUS MACROPHYLLA



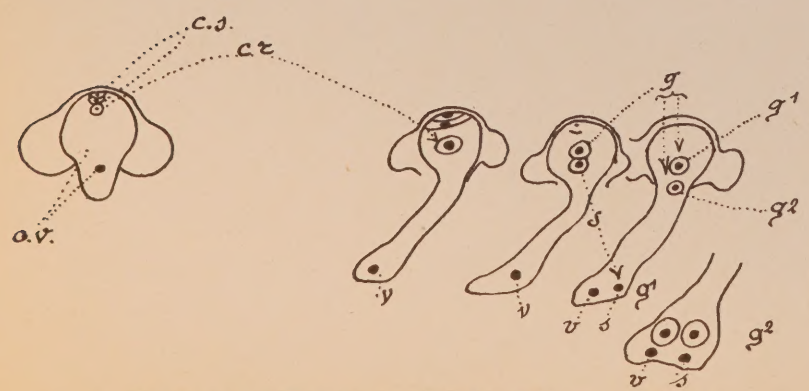
IF ou TAXUS

TAXINÉES

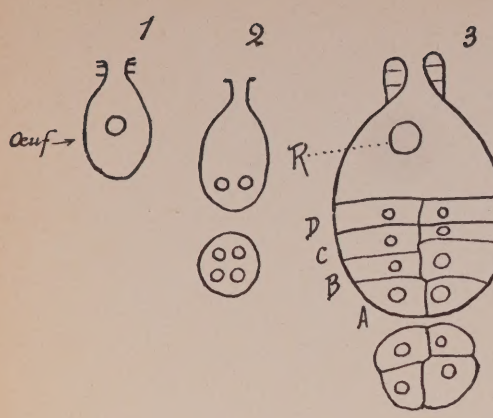
PINUS SYLVESTRIS

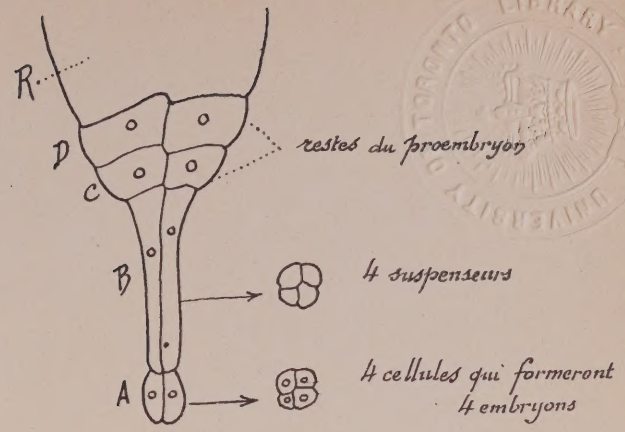


DÉVELOPPEMENT de l'OVULE

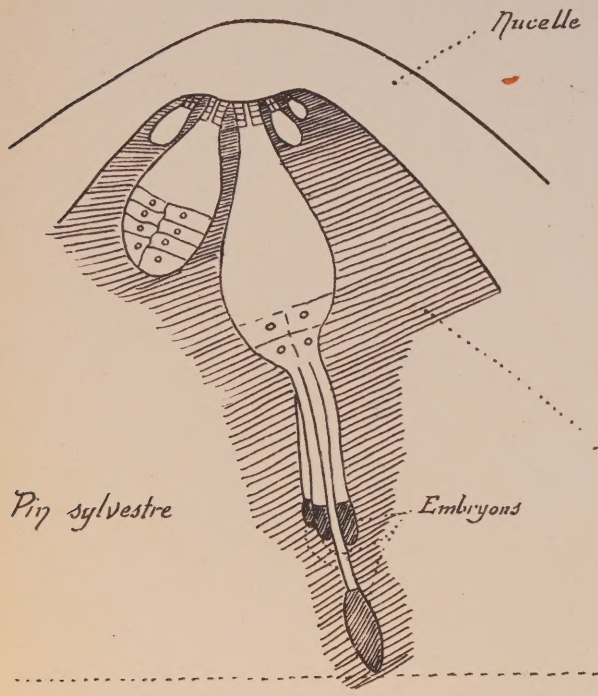


UNIVERSITY OF TORONTO LIBRARY





DÉVELOPPEMENT du PROEMBRYON Pin sylvestre

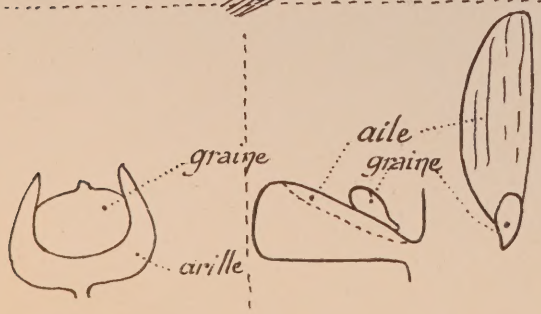


DÉVELOPPEMENT

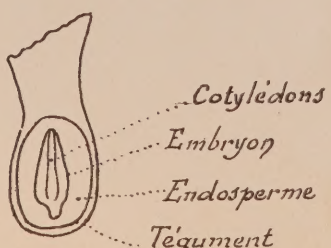
de

l'ŒUF

Cas des Thuja, Cyprès, Epicéa.

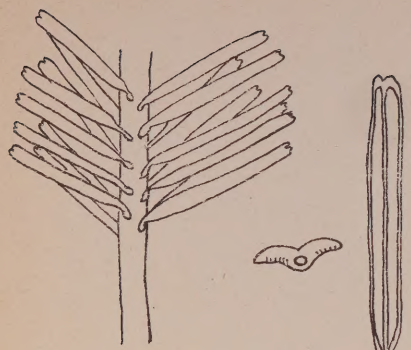


IF PIN

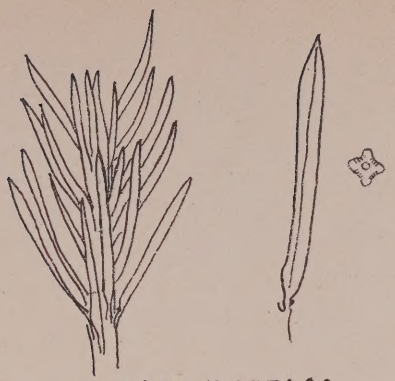


Fruit

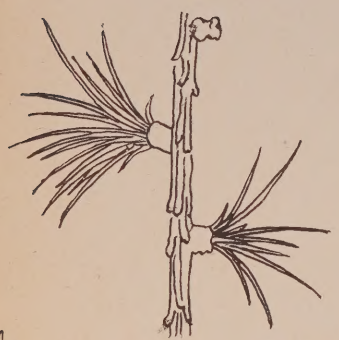
graine ailée de Callitris



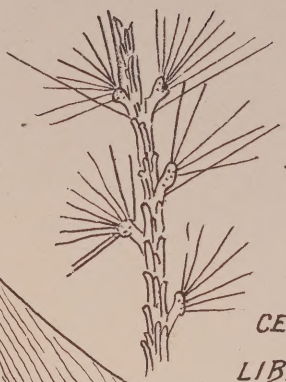
ABIES PECTINATA



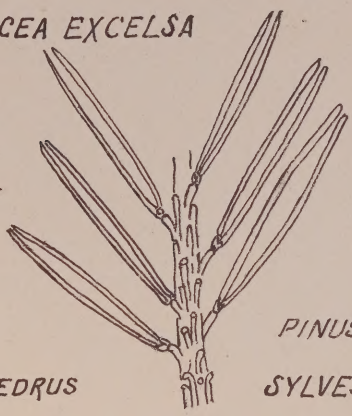
PICEA EXCELSA



LARIX EUROPEA

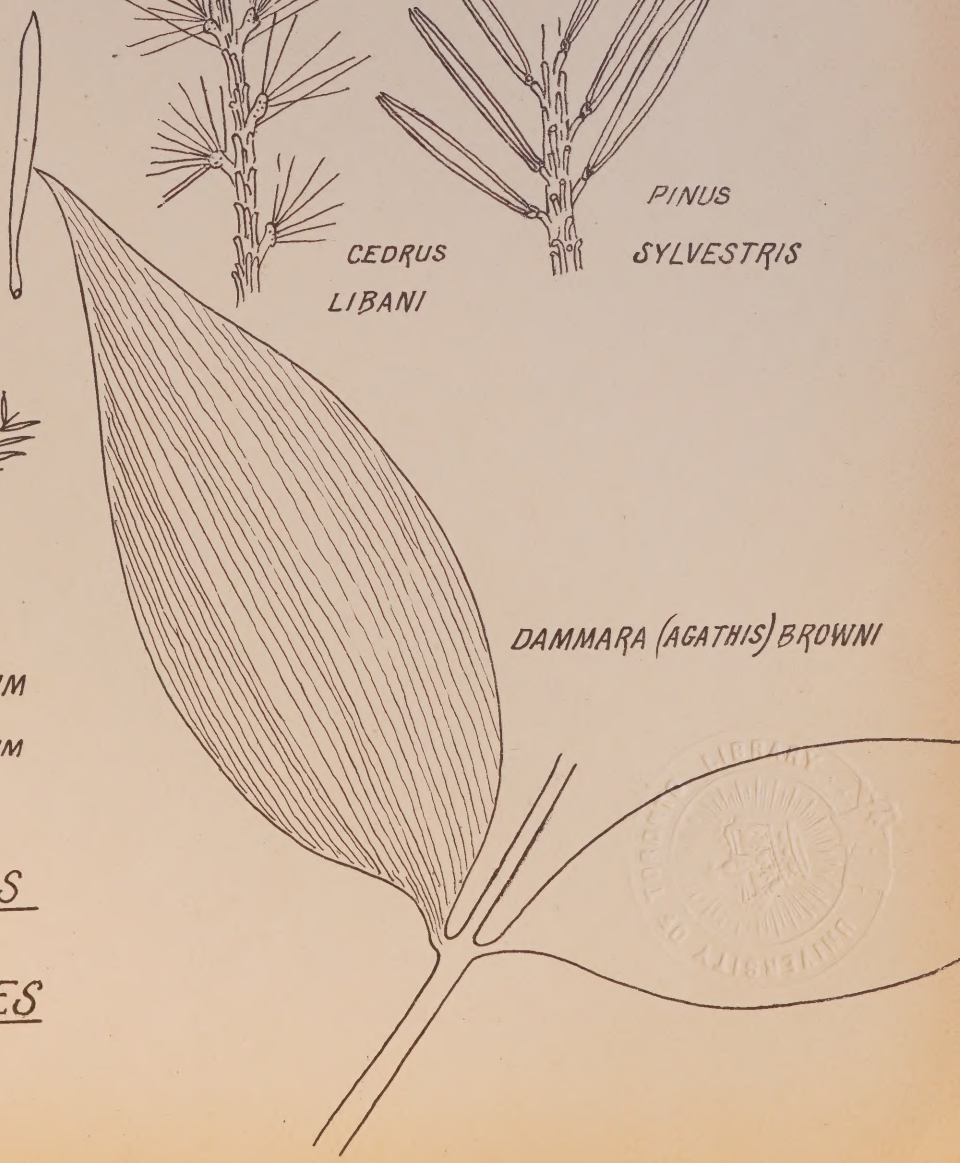


CEDRUS LIBANI



PINUS SYLVESTRIS

TAXODIUM DISTICHUM

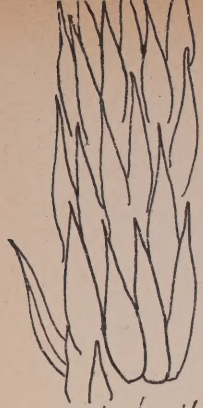


DAMMARA (AGATHIS) BROWNI

FEUILLES de CONIFÉRES

STANFORD UNIVERSITY LIBRARY

UNIVERSITY OF TORONTO LIBRARY



Araucaria bresiliana

A. excelsa

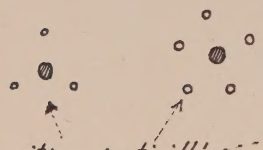
Disposition spiralée

A. Bidwellii

F. type cupressoïde (a

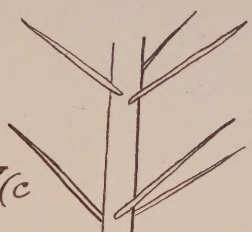
Disposition opposée

E Type thujoïde (b

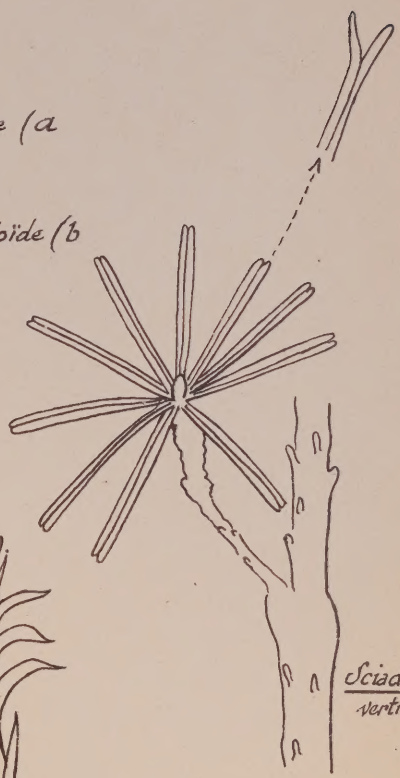


Disposition verticillée

(c



Genévriers (a-b-c)



Sciadopitys verticillata

Thuya

Séquoia gigantea

Disposition spiralée

Disposition verticillée par 2 (opposée)

Cyprés

Cladode .....

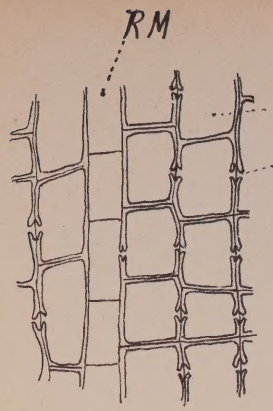
tameau long

écailleuse ...

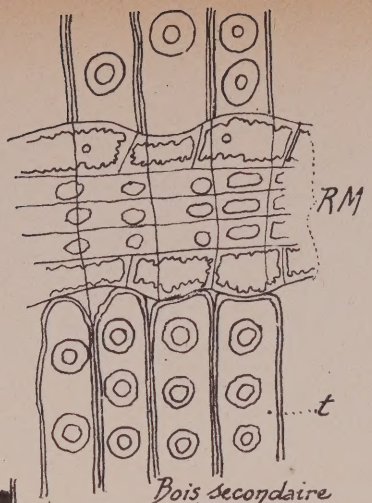
Phyllocladus

DISPOSITION des FEUILLES

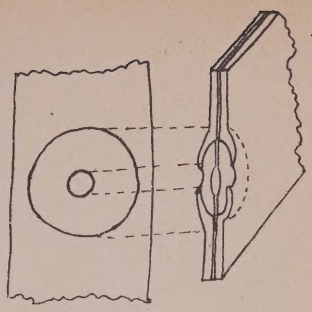
sur les RAMEAUX (CONIFÈRES)



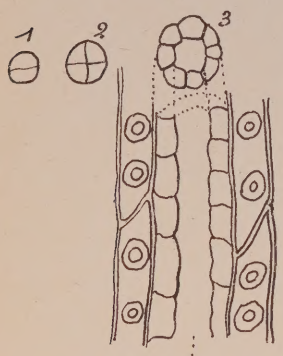
Bois de Pin. Cpe transv.



Bois secondaire de Pin – Coupe long. radiale



Ponctuation aréolée

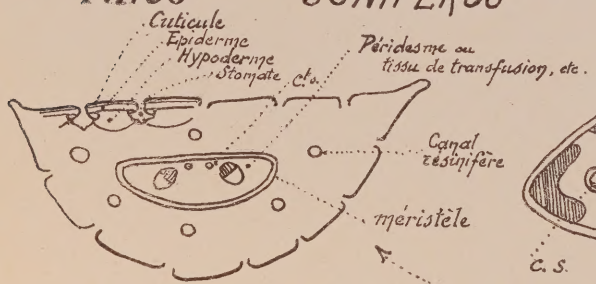


Canal résinifère

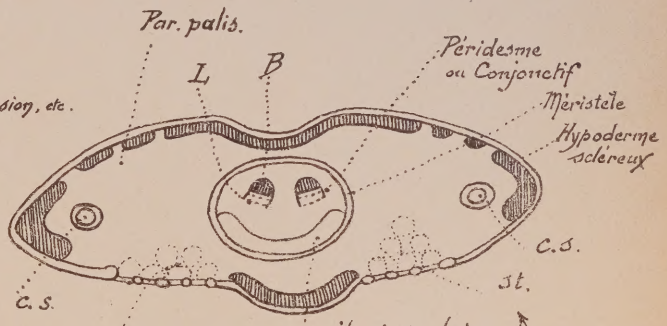
Cellules résinifères

PINUS JUNIPERUS

Trachéide d'If



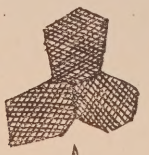
PINUS SYLVESTRIS (coupe tr. de feuille



ABIES PECTINATA

Abiétinées
Cupressinées
Taxodiées

Tissu de transfusion



Taxinées
Podocarpées
(Ginkgoïnées)

LIBRARY OF THE MUSEUM OF COMPARATIVE ZOOLOGY

CONIFÈRES . STRUCTURE de l'APPAREIL VÉGÉTATIF.

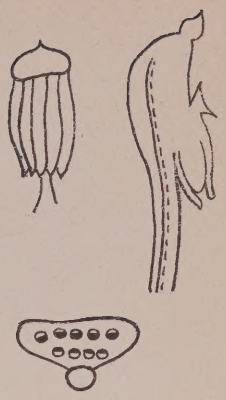
I. PINACÉES

a) Abiétées

♂ ♀

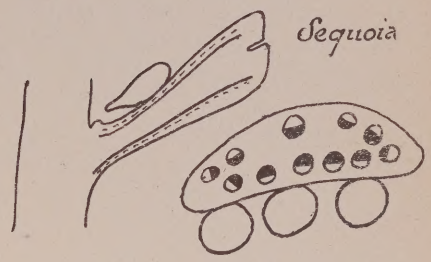
b) Araucariées

♂ ♀



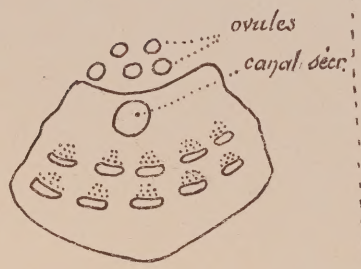
c) Taxodiées

♂ ♀



d) Cupressées

♂ ⊹ ∞



II. TAXACÉES

SUBDIVISION des CONIFÉRALES

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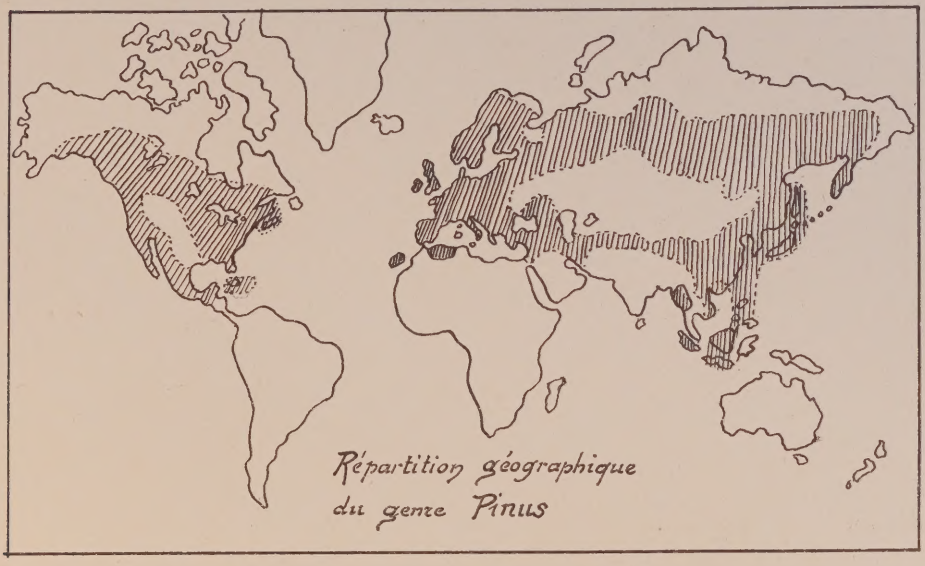
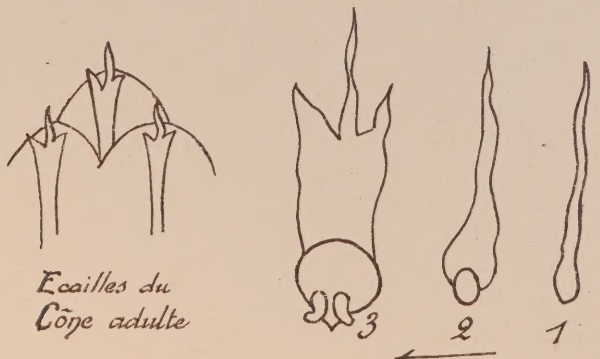
Répartition du genre Tsuga
dans le Tertiaire ● et à l'époque actuelle (III).



Répartition géographique
du genre Pinus



Ecailles du
Cône adulte

Ecailles jeunes

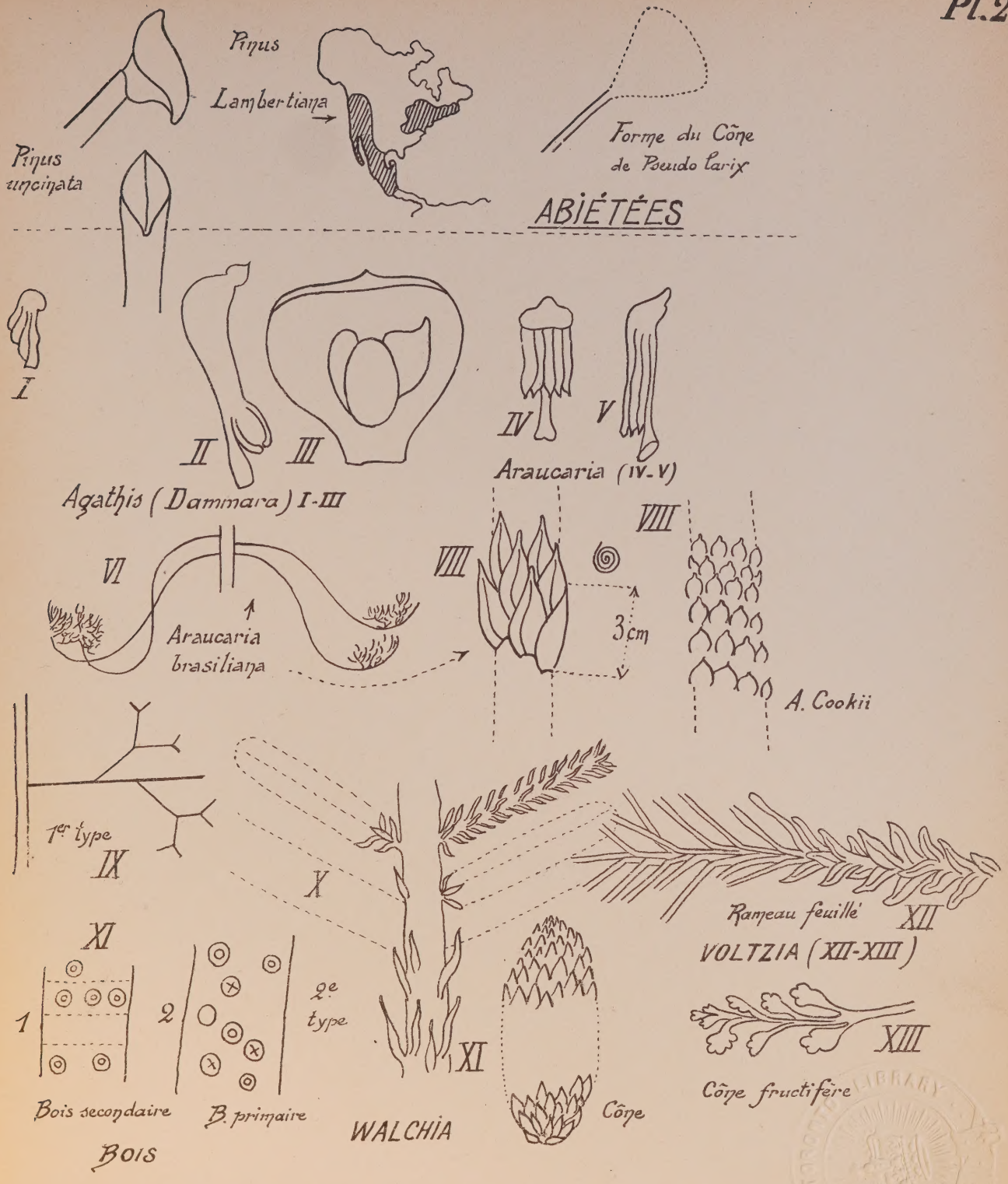
Comparaison
avec
Abies
pectinata
(jeune)

E. tectrice rudimentaire

TSUGA

PSEUDO TSUGA Douglasii

LIBRARY

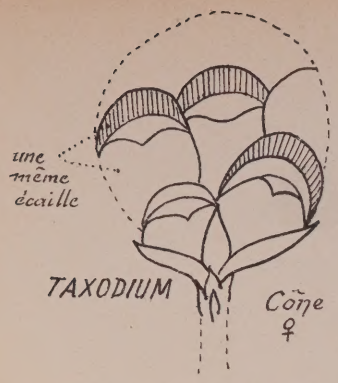


ARAUCARIÉES (I-XIII)

TAXODIÉES

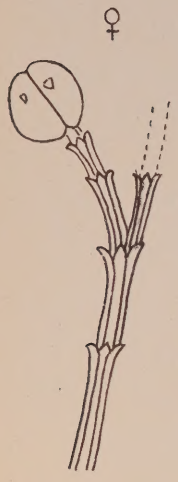
TAXODIUM DISTICHUM

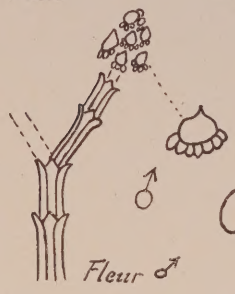
Pl. 23



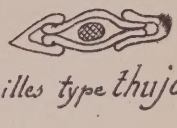
LIBRARY OF THE UNIVERSITY OF ILLINOIS

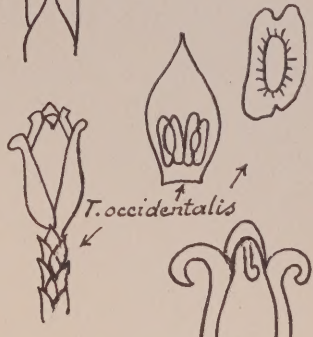
CUPRESSÉES



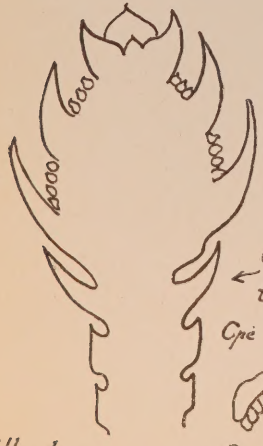


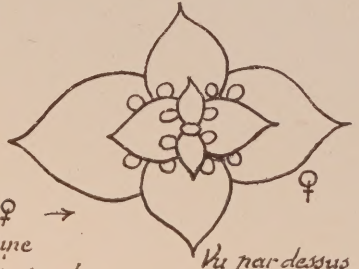
CALLITRIS QUADRIVALVIS

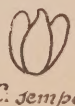




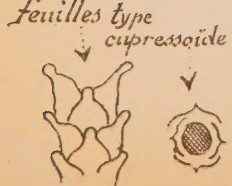
Thuya

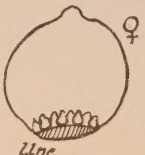






C. sempervirens

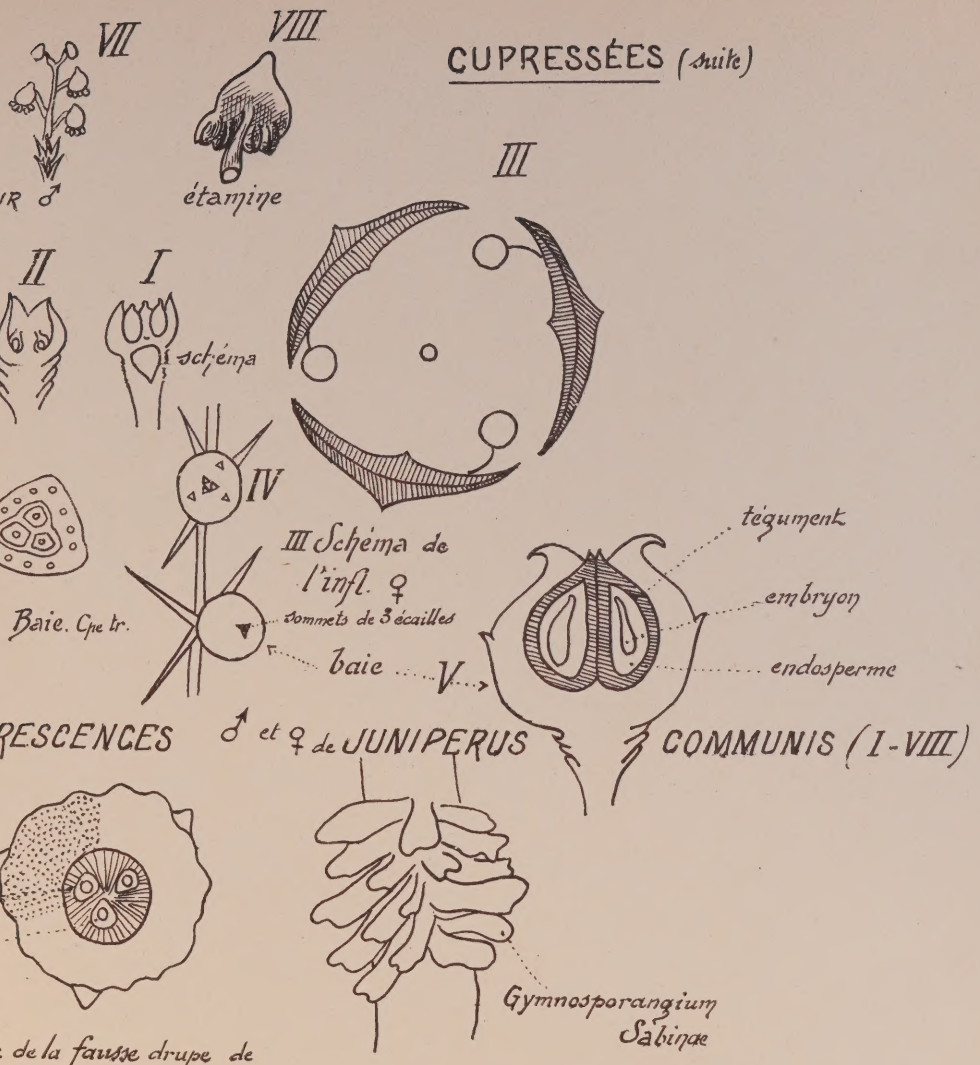




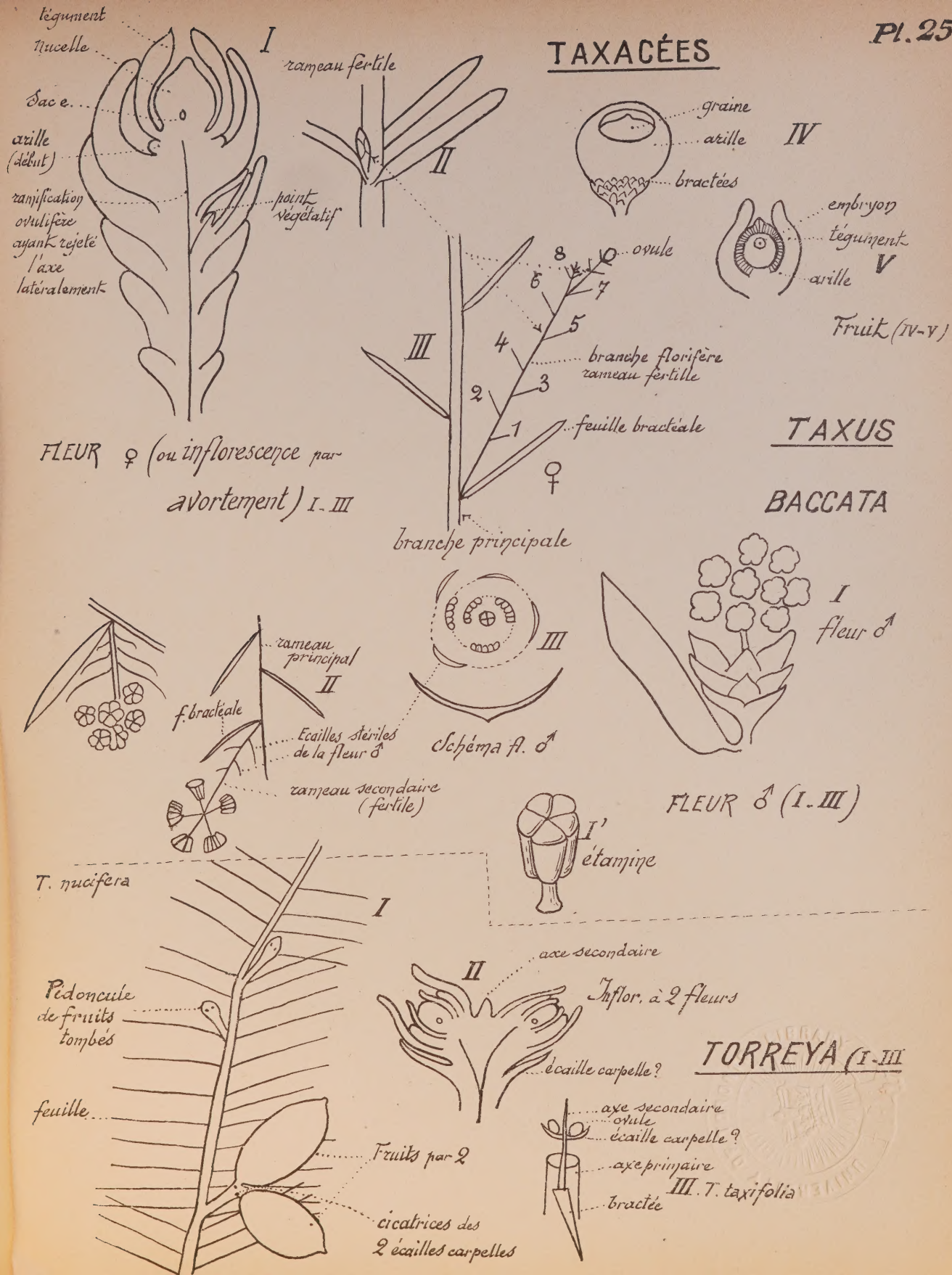
CUPRESSUS

UNIVERSITY OF TORONTO LIBRARY

CUPRESSÉES (suite)



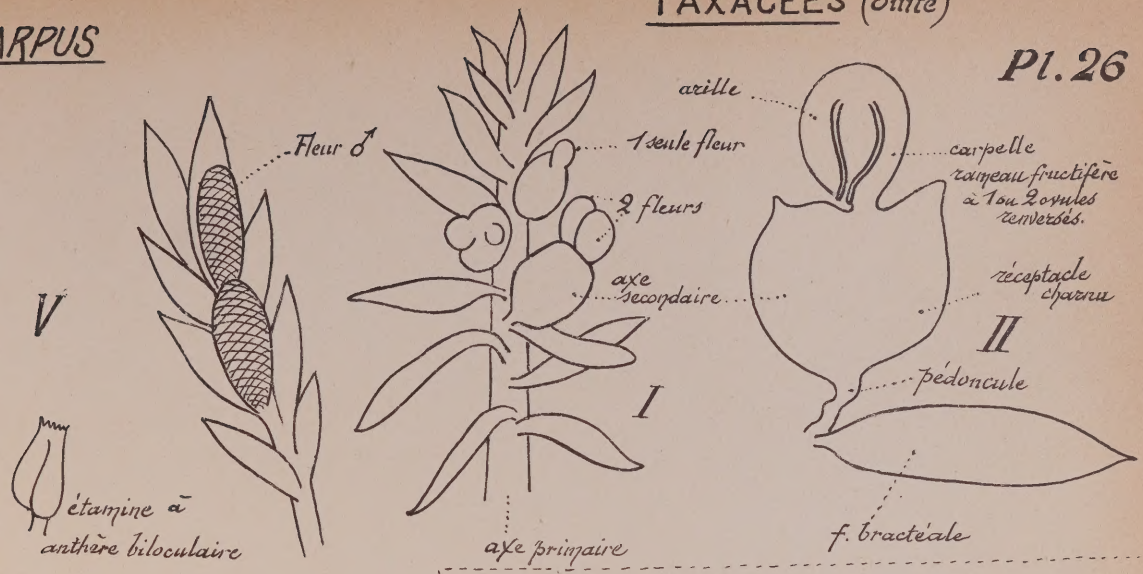
TAXACÉES


tégument
nucelle
Sac e.
arille (début)
ramification ovulifère ayant rejeté l'axe latéralement
I
rameau fertile
point végétatif
II
graine
arille
bractées
IV
embryon
tégument
arille
V
Fruit (IV-V)
8
9
ovule
6
7
5
4
III
branche florifère
rameau fertile
2
3
1
feuille bractéale
♀
branche principale
FLEUR ♀ (ou inflorescence par avortement) I-III
TAXUS
BACCATA
I
fleur ♂
rameau principal
II
f. bractéale
écailles stériles de la fleur ♂
rameau secondaire (fertile)
III
Schéma fl. ♂
FLEUR ♂ (I-III)
I'
étamine
T. nucifera
I
Pédoncule de fruits tombés
feuille
Fruits par 2
cicatrices des 2 écailles carpelles
II
axe secondaire
Inflor. à 2 fleurs
écaille carpelle?
TORREYA (I-III)
axe secondaire
ovule
écaille carpelle?
axe primaire
bractée
III. T. taxifolia

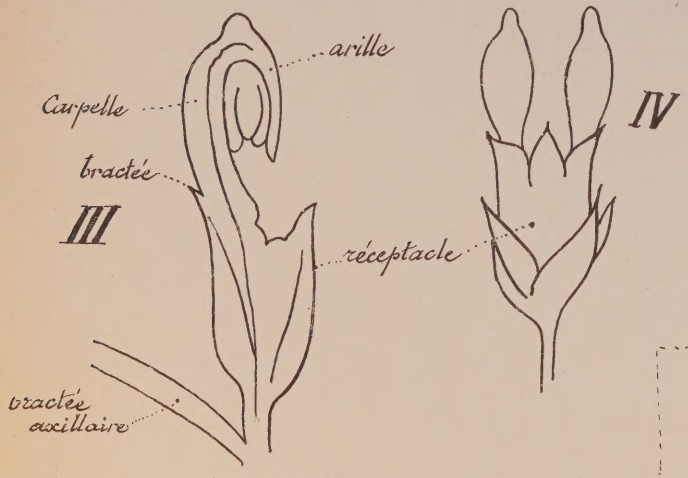
TAXACÉES (Suite)

Pl. 26

PODOCARPUS

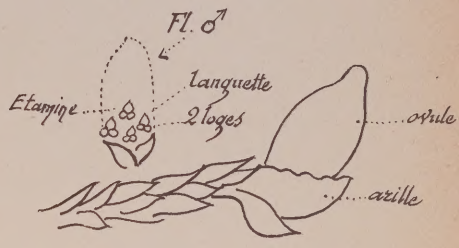


PODOCARPUS TOTARA



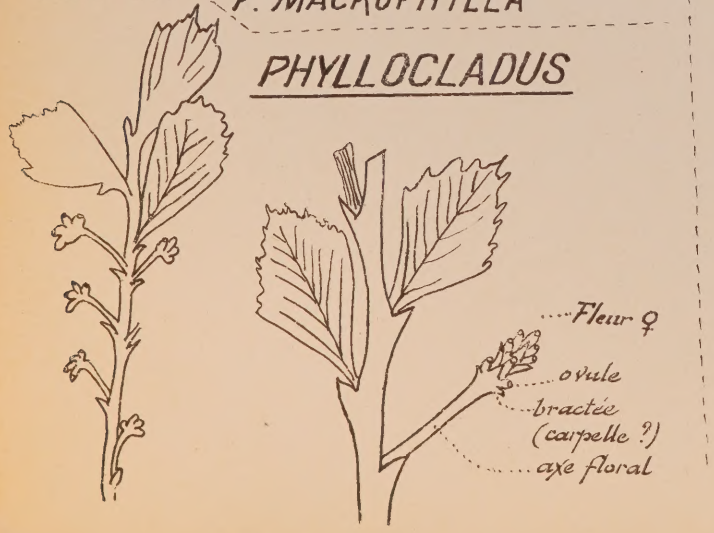
P. MACROPHYLLA

DACRYDIUM



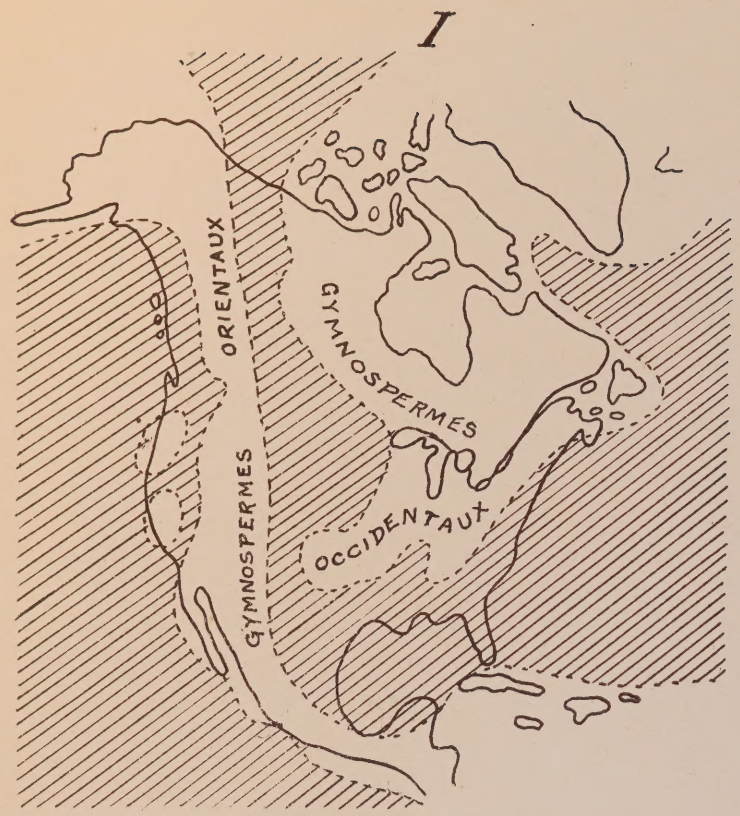
D. CUPRESSINUM

PHYLLOCLADUS

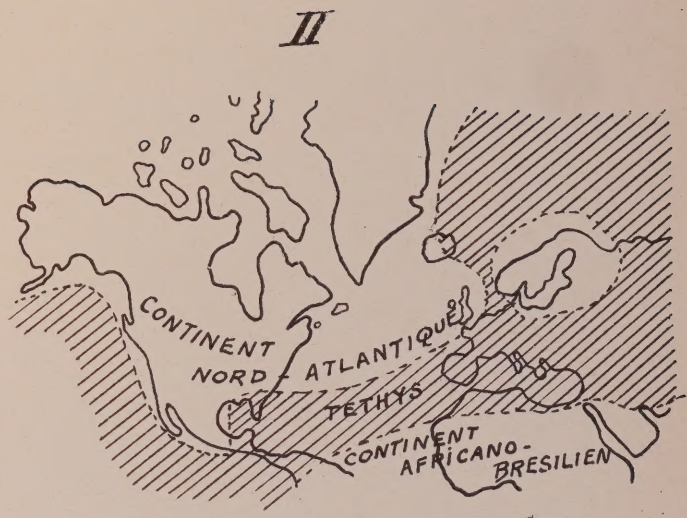


PHYLLOCLADUS GLAUCA ♀

PHYLLOCLADUS TRICHOMANOIDES ♂



I. Amérique du Nord à la fin du Crétacé – On voit les deux masses continentales distinctes ayant permis l'évolution séparée des Gymnospermes orientaux et occidentaux



II. Le pont nord-atlantique à l'époque nummulitique au début de sa rupture avec l'Europe.

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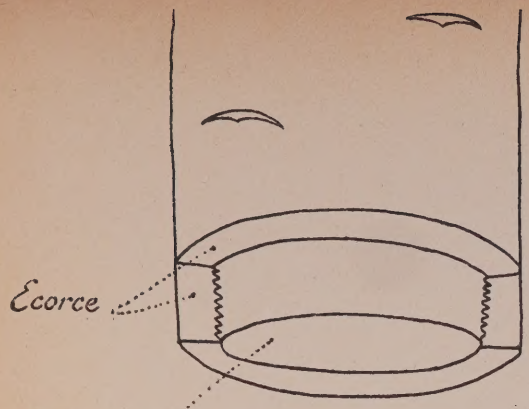
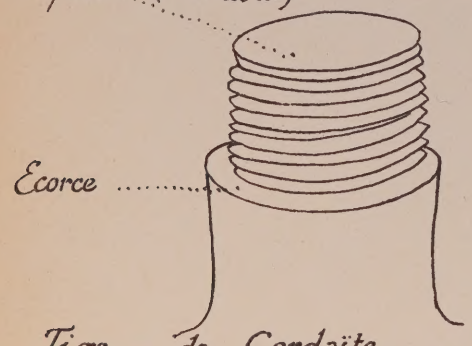
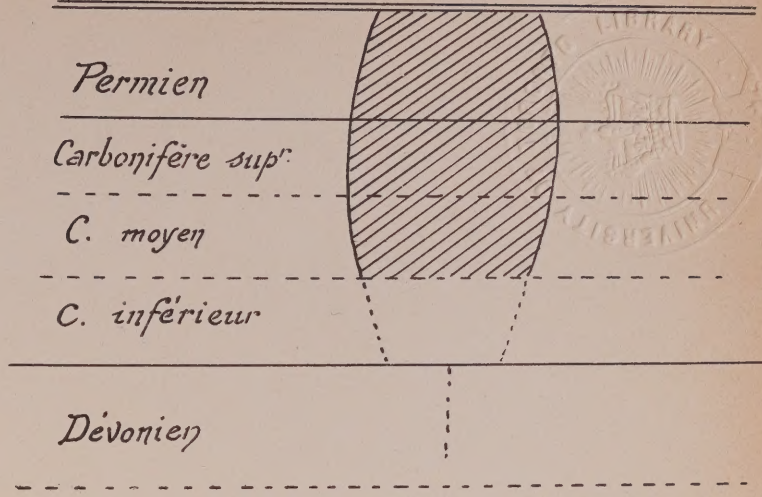
Pl. 27

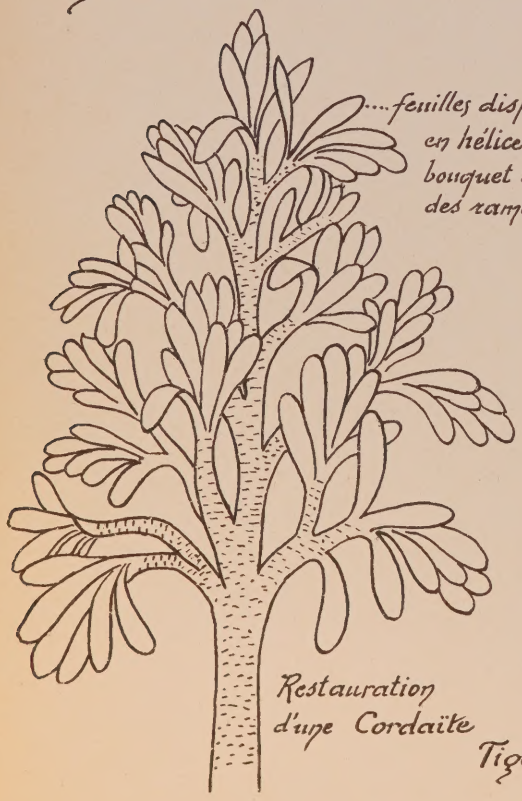
TORONTO LIBRARY
UNIVERSITY OF TORONTO





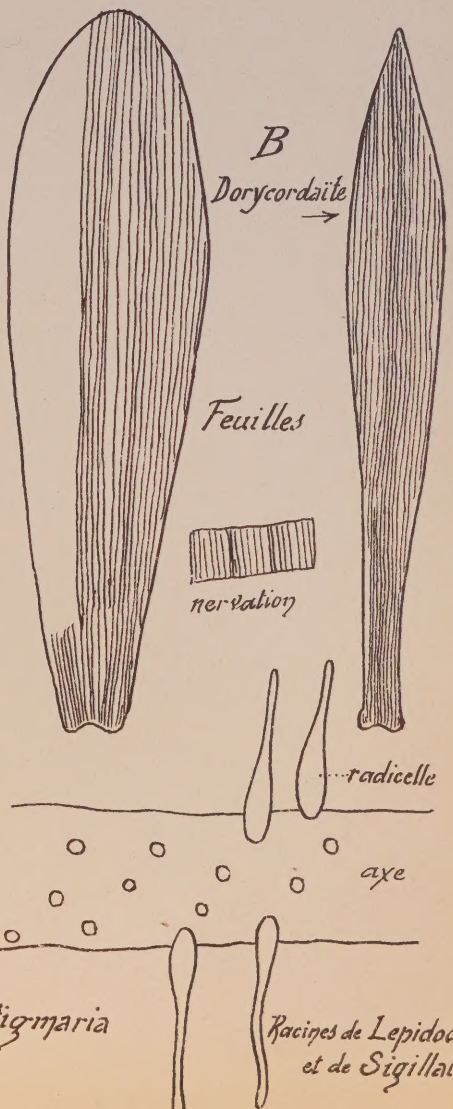
Tige de Cordaïte





Restauration d'une Cordaïte

Tige de Cordaïte



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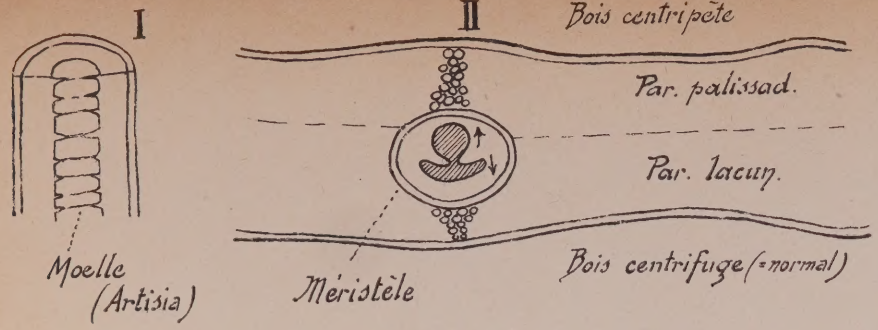
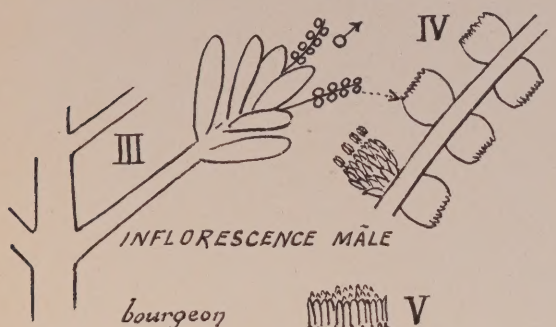
Coupe transv. dans la feuille de Cordaïtes linguatulus

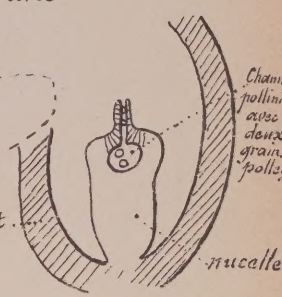


CORDAÏTE (I-VII)

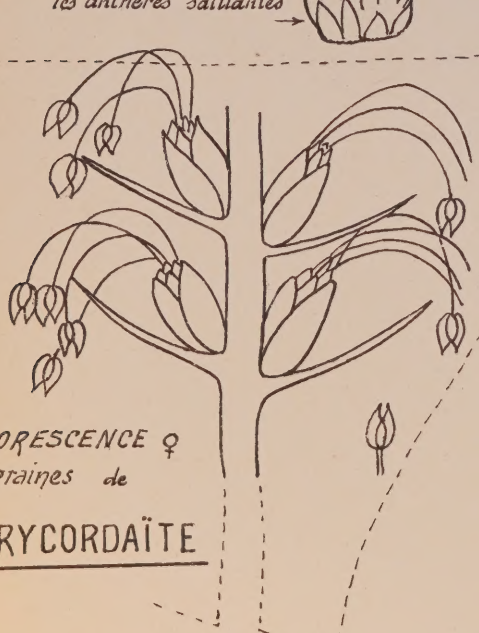


bourgeon floral grossi montrant les anthères saillantes

Inflorescence femelle de Cordaïte avec graines.

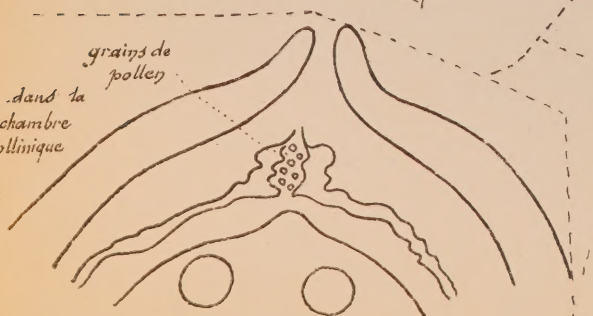


VII Coupe d'un ovule

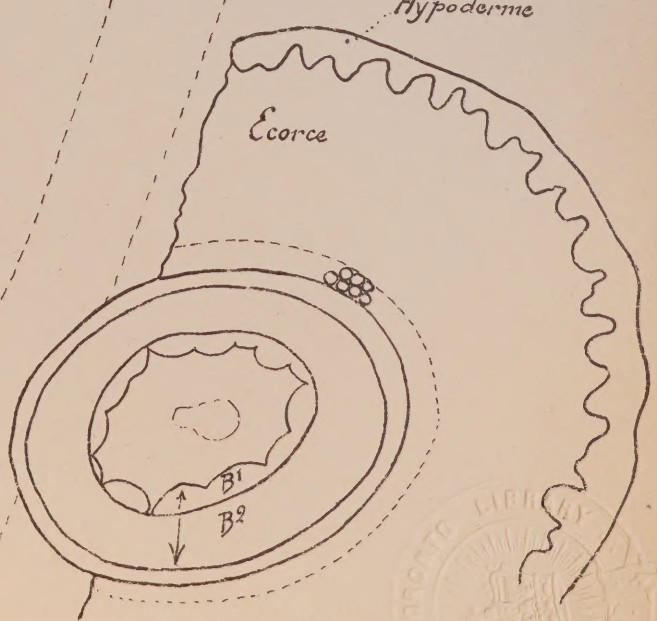


INFLORESCENCE ♀ et graines de

DORYCORDAÏTE



Coupe long. d'un ovule de Cordaïtale Cycadinocarpus augustodinensis (Renault).

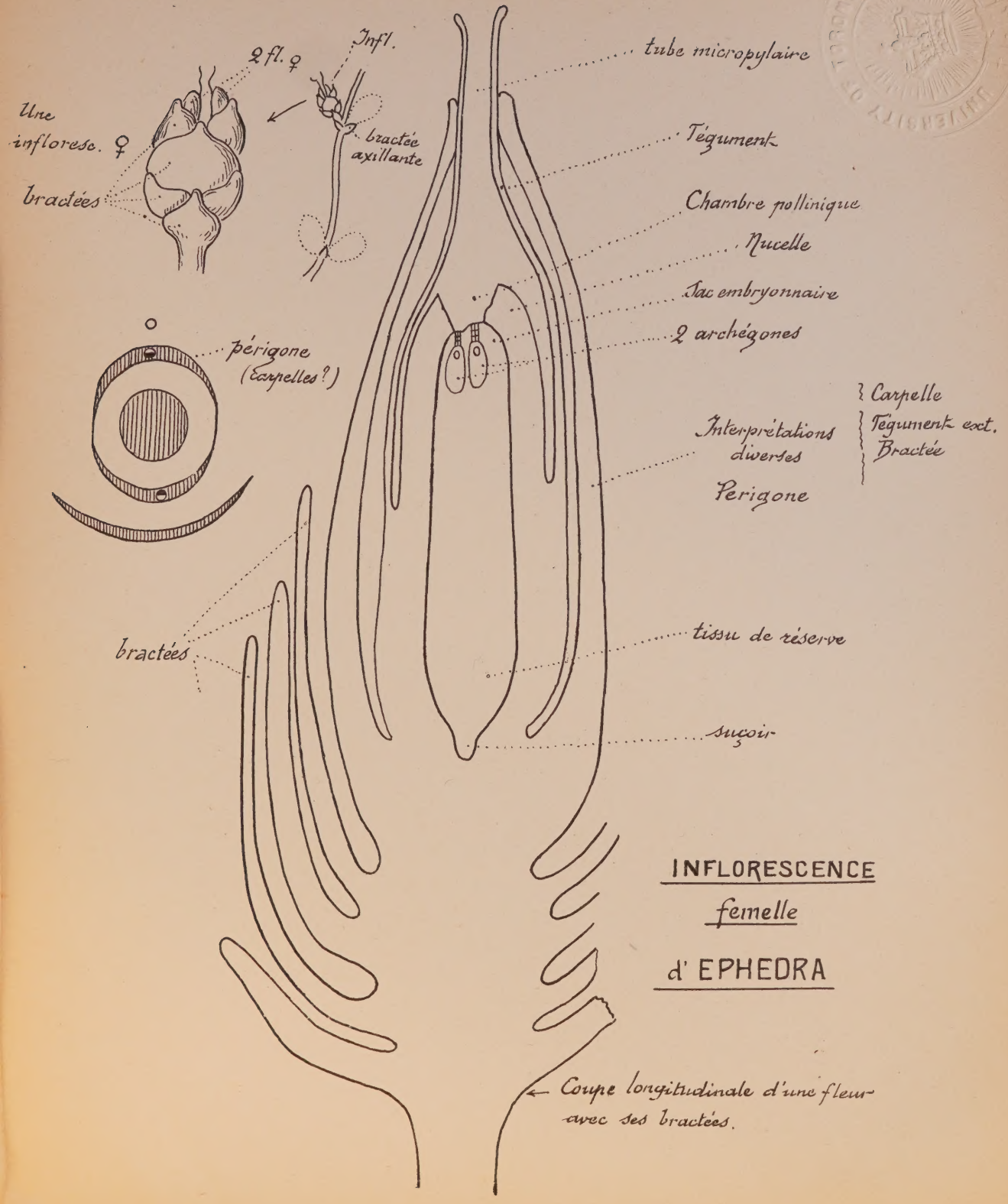


POROXYLÉES

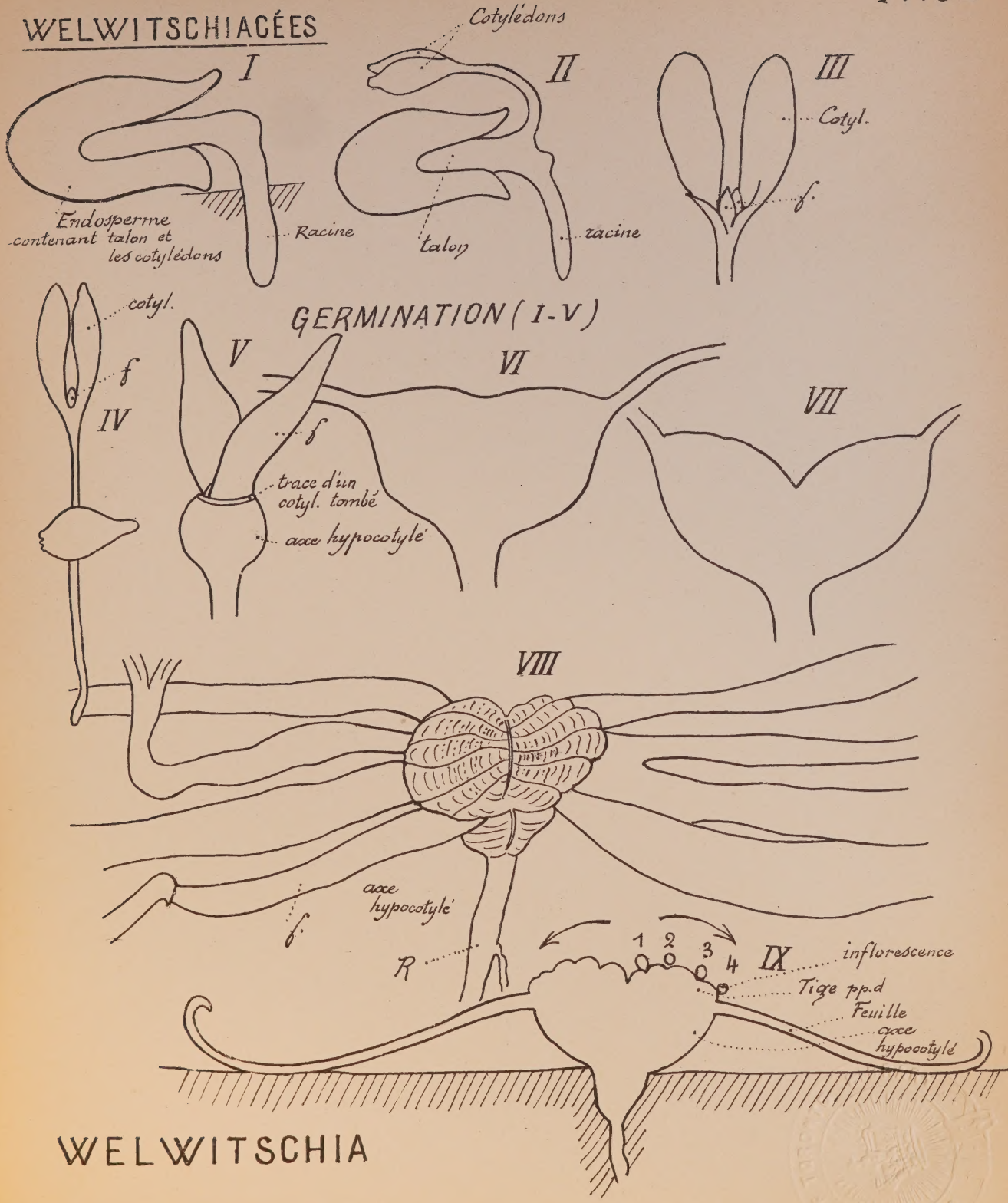
Anatomie de la tige

Evolution cytologique du grain de pollen chez Ephedra trifurca (1-8).

ÉPHÉDRACÉES (Suite)

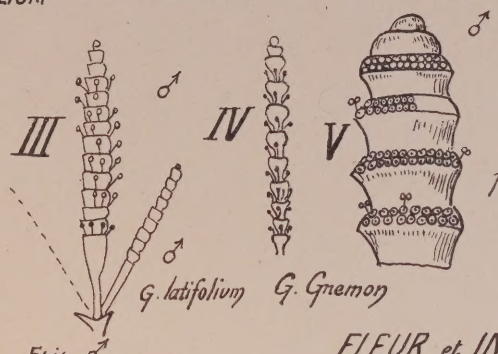


WELWITSCHIACÉES



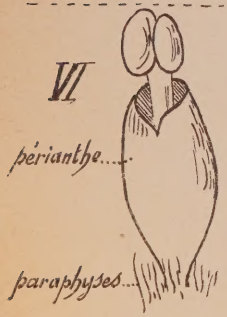
WELWITSCHIA

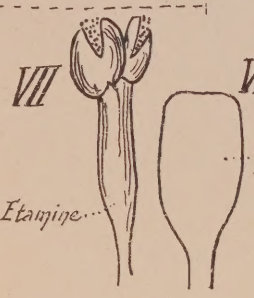
ANATOMIE D'UNE TIGE DE GNETUM PRESENTANT DES CAMBIUM CONCENTRIQUES



Extrémité supérieure grossie de l'infl. ♂ grossie de G. latifolium pour montrer la disposition des fl. ♀ dans les cupules

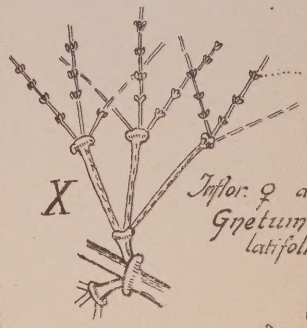
FLEUR et INFLORESCENCE MÂLES (III-V)

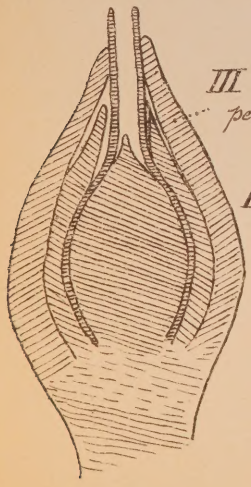




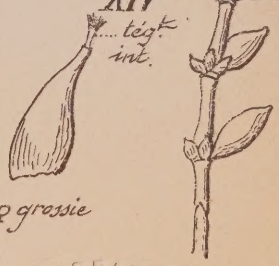
GNETUM GNEMON

Fl. ♂ de Gnetum latifolium



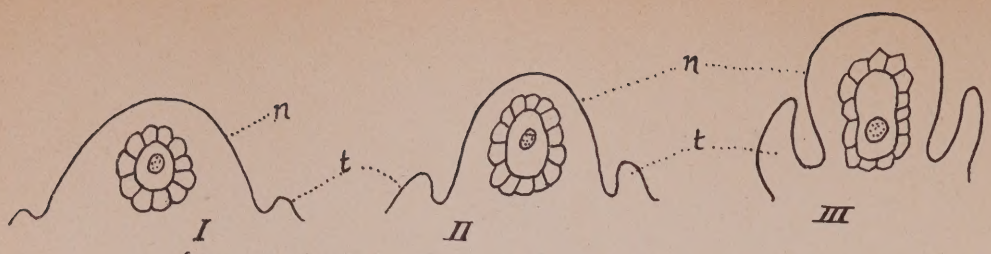


G. latifolium

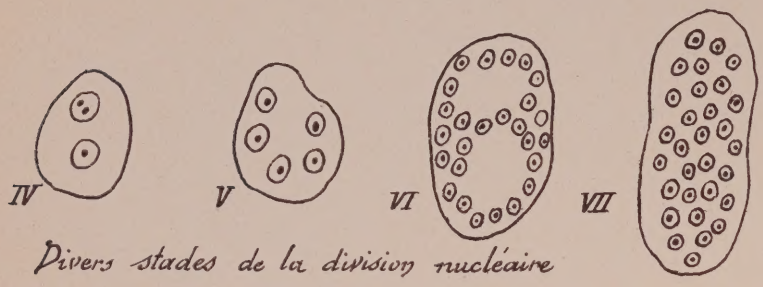


FLEUR et INFLORESCENCE FEMELLES (X-XV)

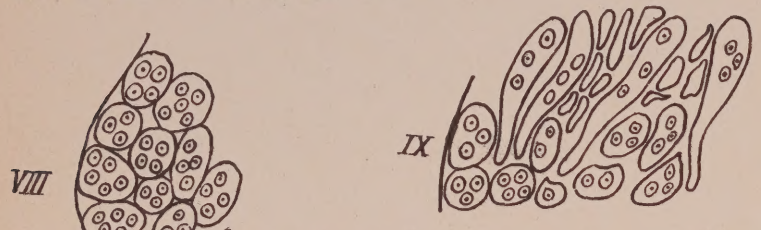
GNÉTACÉES



Divers stades de la différenciation de la cellule mère du sac embryonnaire
t : coupe transversale de l'ébauche du tégument interne — n : nucelle.

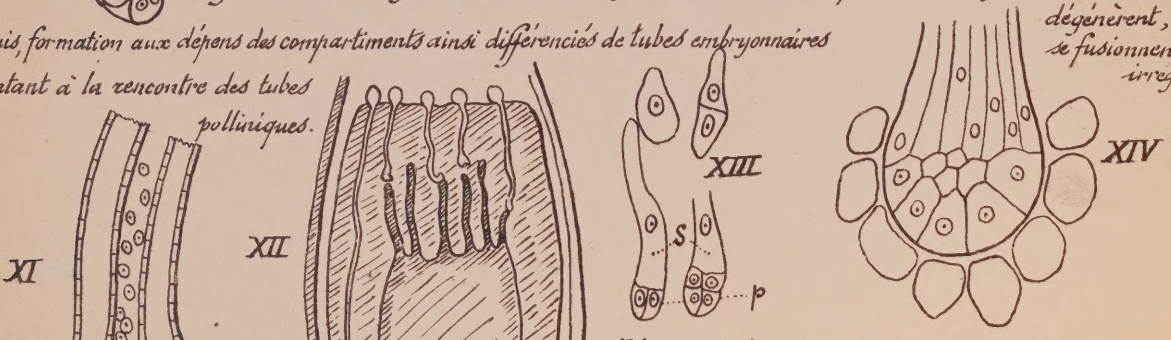


Divers stades de la division nucléaire à l'intérieur de la cellule mère.



Segmentation irrégulière autour des noyaux libres puis formation aux dépens des compartiments ainsi différenciés de tubes embryonnaires montant à la rencontre des tubes polliniques.

Dans la région inférieure du sac embryonnaire, les compartiments n'ayant aucun rôle sexuel dégénèrent, les noyaux se fusionnent en masses irrégulières.



Le sac embryonnaire envoie des prolongements à la rencontre des tubes polliniques.

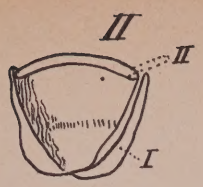
Débuts de la formation de l'embryon,
S : suspenseur
p : proembryon

Le proembryon à l'extrémité de son suspenseur plongé à l'intérieur des tissus dégénérés du trophophyte.

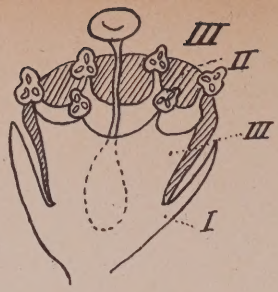
FORMATION du SAC EMBRYONNAIRE et FÉCONDATION

WELWITSCHIA

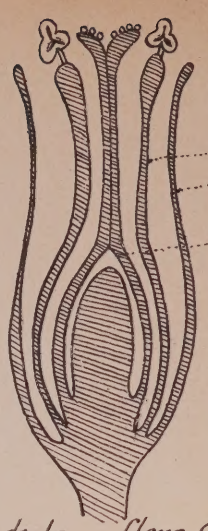
I. Cône ♂



II. Fleur ♂ avant son ouverture : le verticille staminal est encore caché sous les 2 vert. périanthaires



III. Fl. ♂ dégagée de la bractée mère



Coupe long. de la fleur ♂

INFLORESCENCE et FLEUR ♂ (I-V).

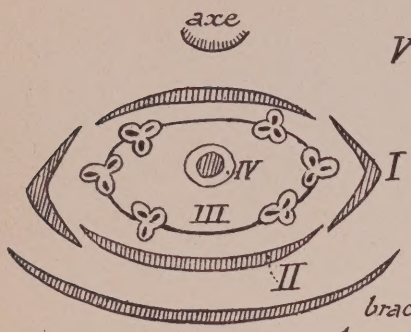
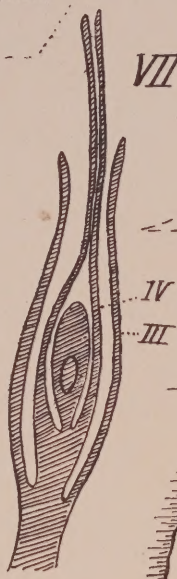
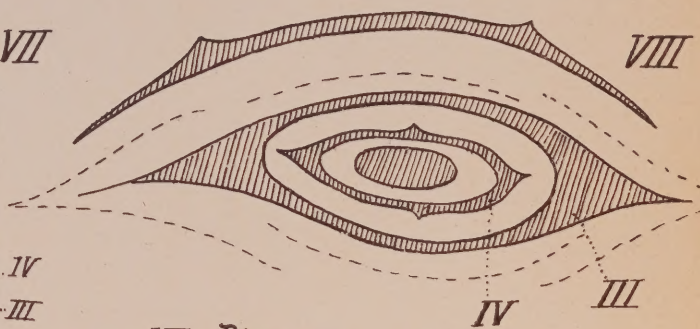


Diagramme de la fleur ♂

VI Cône ♀



VII. Coupe long. de la fleur ♀

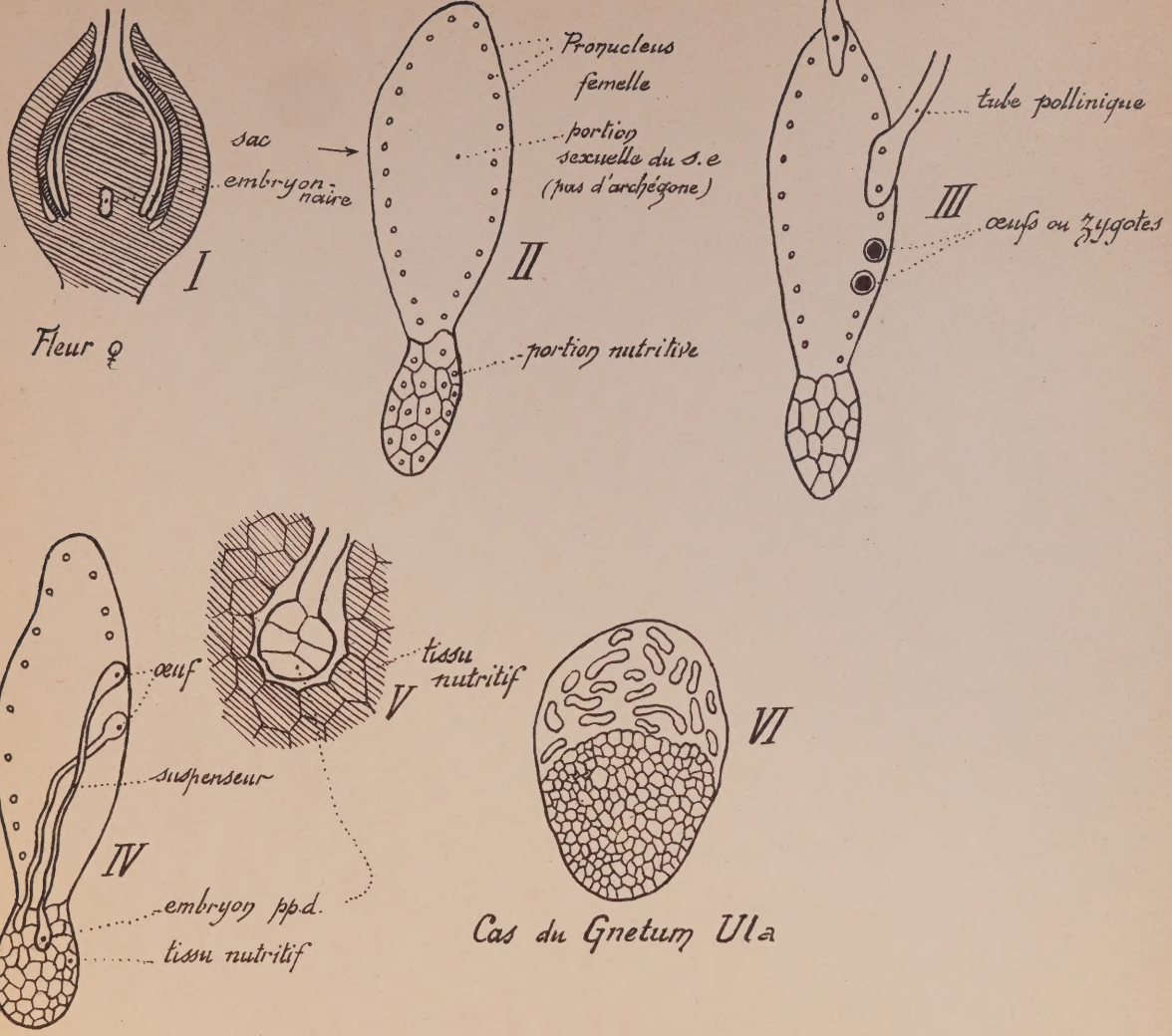


VIII. Diagramme de la fleur ♀

INFLORESCENCE et FLEUR ♀ (VI-VIII)

WELWITSCHIA

GNÉTACÉES (suite)



LES PROCESSUS CYTOLOGIQUES DE LA SEXUALITÉ CHEZ LES GNETUM

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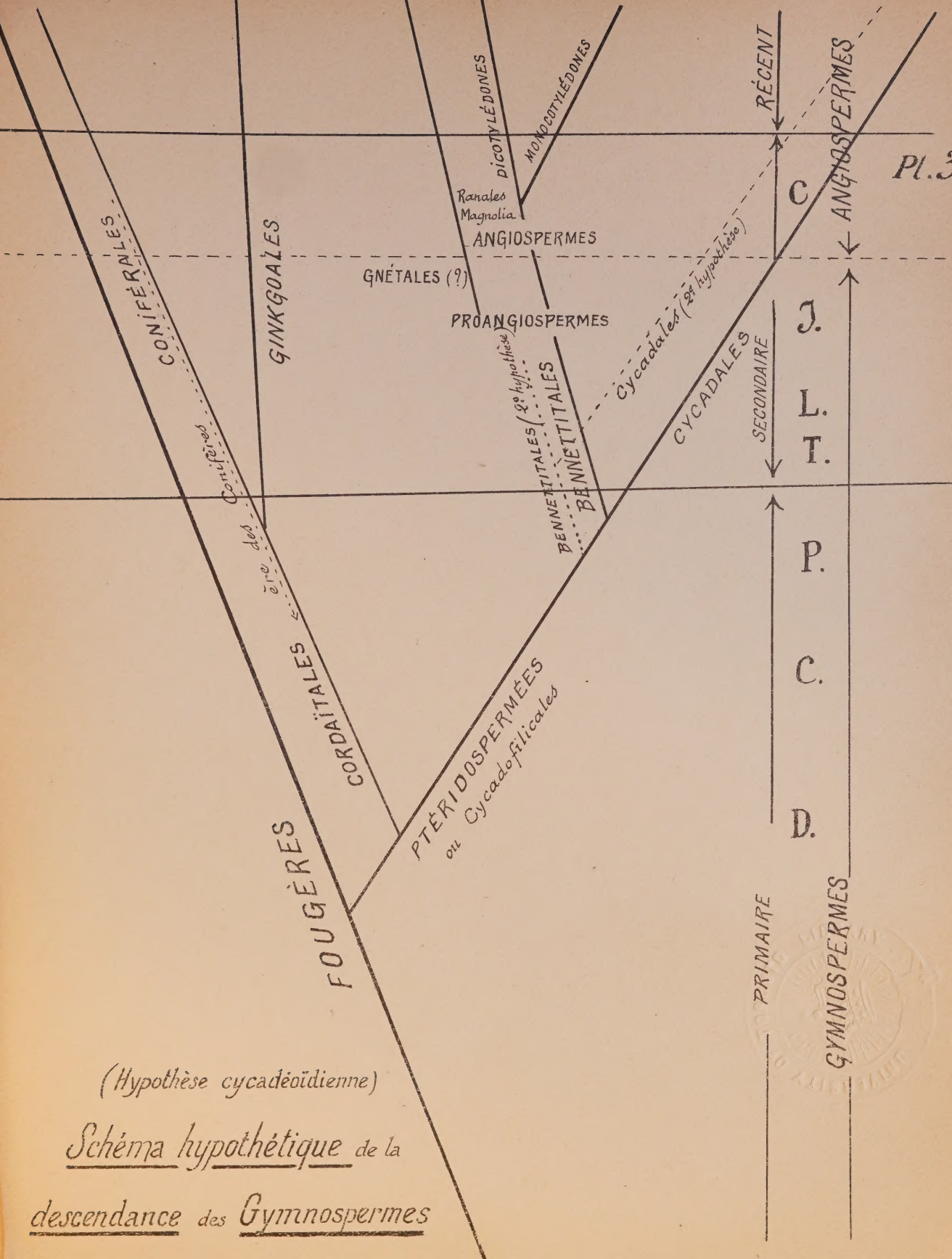
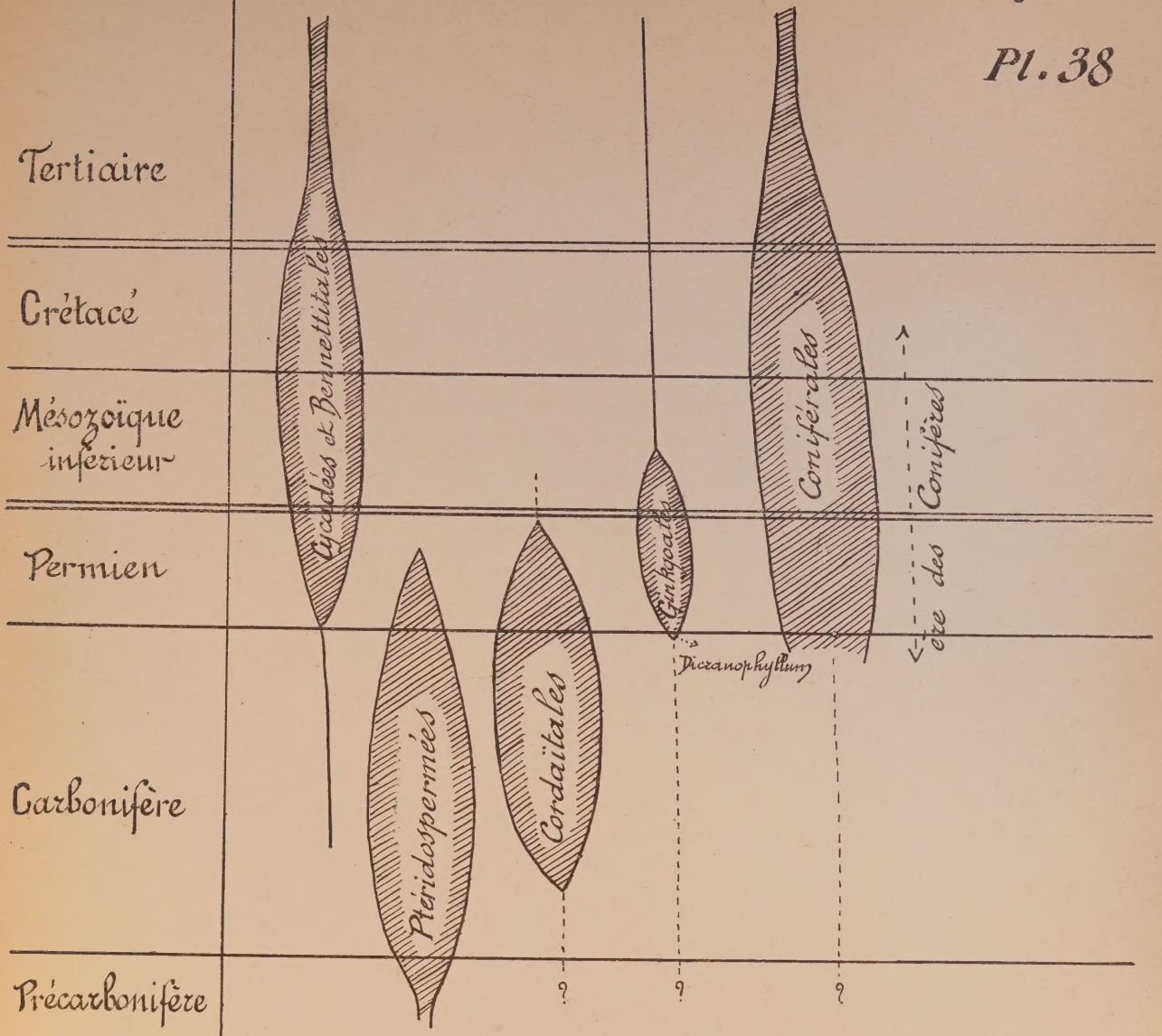


(Hypothèse cycadéoïdienne)

Schéma hypothétique de la descendance des Gymnospermes

Les Gymnospermes dans les Temps paléontologiques

Pl. 38



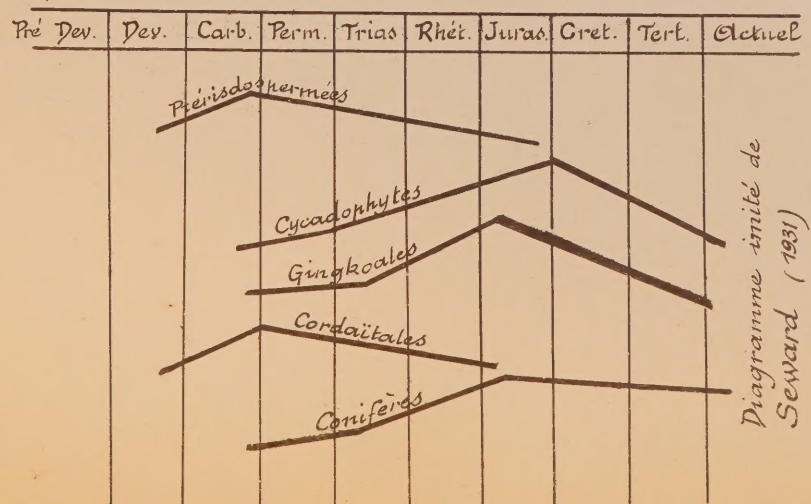


Diagramme imité de Seward (1931)

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PLANCHES DE L'ATLAS

1. Généralités morphologiques et anatomiques.
2. Ptéridospermées.
3. Ptéridospermées.
4. Ptéridospermées (fin). Ginkgoïnées.
5. Cycadinées.
6. Cycadinées.
7. Cycadinées.
8. Cycadinées.
9. Ginkgoïnées, Bennettitinées, Dicranophyllum.
10. Bennettitinées (suite), Wielandiella, Williamsoinella, Caytonia, Magnolia.
11. Conifères-Inflorescence, etc... (Abiétées).
12. Conifères-Inflorescence : Abiétées (suite), Taxodiées.
13. Conifères-Inflorescence : Araucariées, Cupressées.
14. Taxinées.
15. Pin sylvestre, ovule et pollen.
16. Pin, etc... Développement de l'œuf.
17. Feuilles des Conifères.
18. Disposition des feuilles et rameaux chez les Conifères.
19. Conifères : structure de l'appareil végétatif.
20. Subdivisions des Coniférales.
21. Tsuga et Pseudotsuga. Cartes de répartition des genres Tsuga et Pinus.
22. Abiétées (fin). Araucariées. Walchia et Voltzia.
23. Taxodiées. Cupressées.
24. Cupressées (fin).
25. Taxacées : Taxus et Torreya.
26. Taxacées (suite) : Podocarpus, Dacrydium, Phyllocladus.
27. Carte de la répartition des Gymnospermes dans l'Amérique du Nord à la fin du Crétacé. Le pont nord-atlantique à l'époque nummulitique.
28. Cordaïtales.
29. Cordaïtales (fin). Poroxylées.
30. Gnétales : Ephedracées, appareil végétatif, inflorescence et fleurs mâles.
31. Ephedra, inflorescence et fleur femelle.
32. Welwitschia, appareil végétatif.
33. Welwitschia, inflorescence et fleurs.
34. Welwitschia, formation du sac embryonnaire et fécondation.
35. Gnetum, appareils végétatif et reproducteur.
36. Processus cytologique de la sexualité chez les Gnetum.
37. Schéma hypothétique de la descendance des Gymnospermes.
38. Schéma de la répartition paléontologique des Gymnospermes.

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